

# Atlas

of the

# HUMAN DENTITION

SECOND EDITION



**Charles J. Goodacre, DDS, MSD**

Robert Knabenbauer, Medical Illustrator  
Rob Holland, Graphic and Multimedia Designer  
Mirosljub Ilich, CDT, Morphology Consultant

# **Atlas of the Human Dentition**

Second Edition

by

Charles J. Goodacre, DDS, MSD

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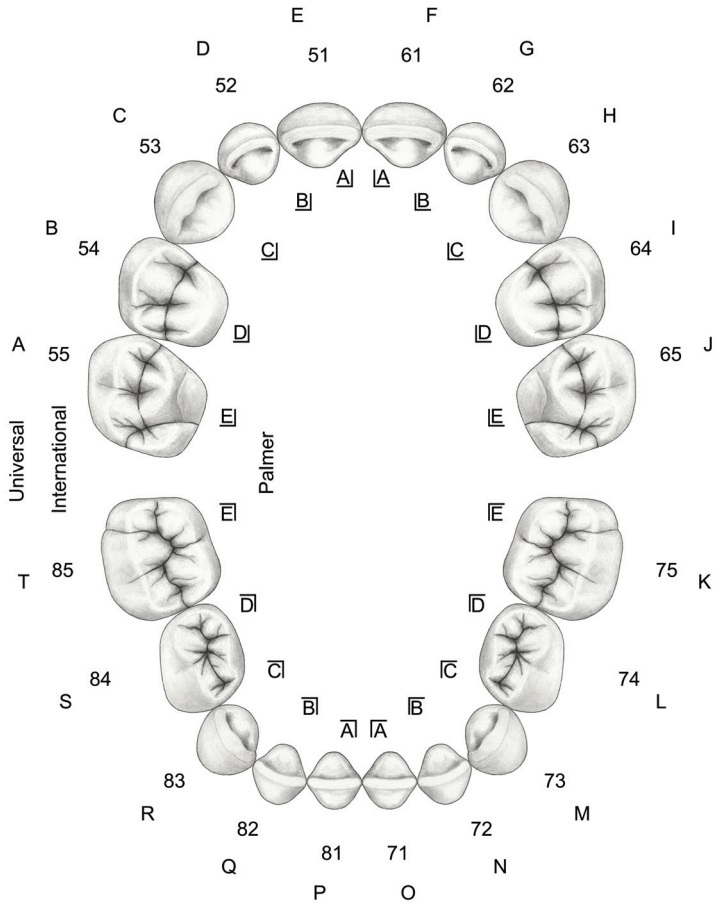
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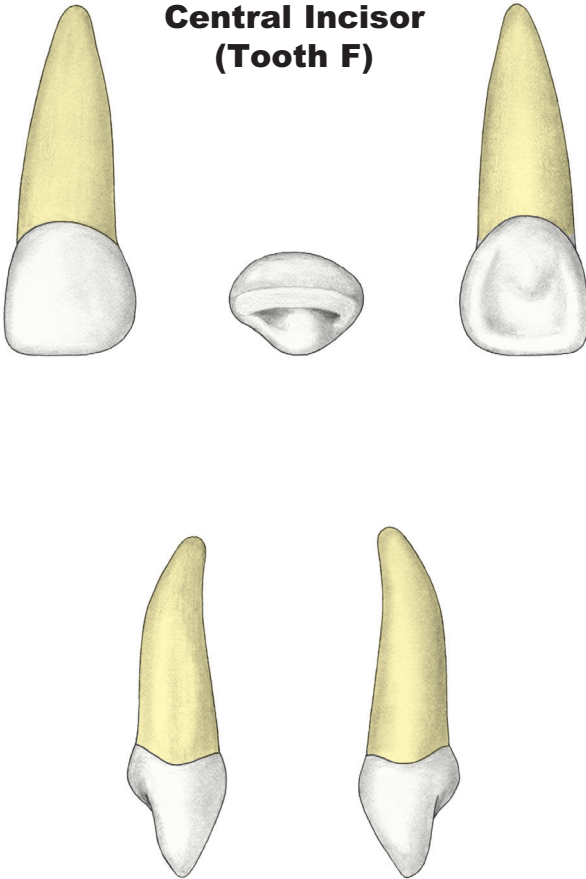
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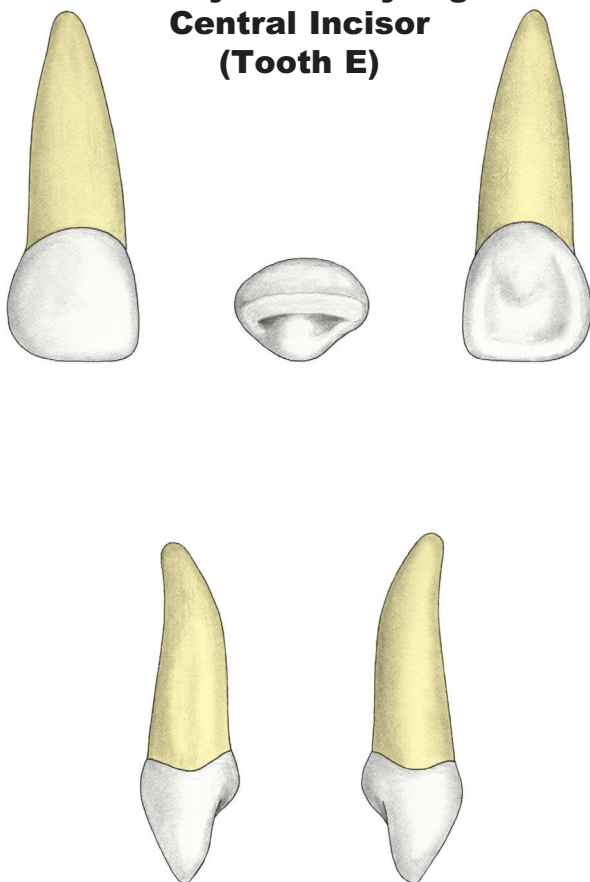
# Primary Dentition



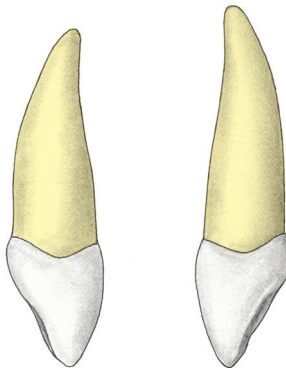
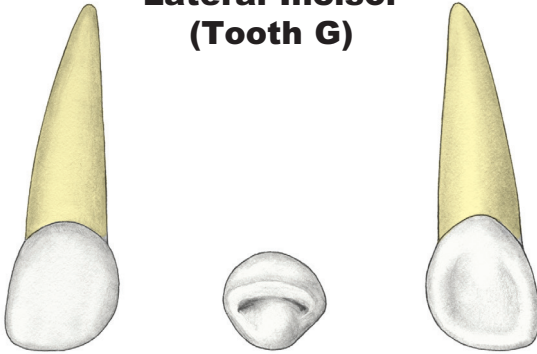
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Central Incisor  
(Tooth F)**



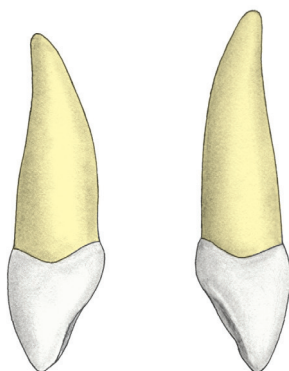
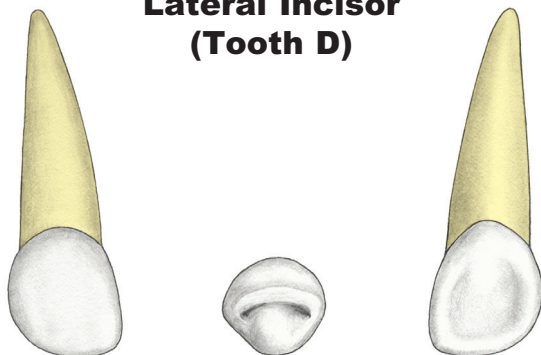
**Primary Maxillary Right  
Central Incisor  
(Tooth E)**



**Primary Maxillary Left  
Lateral Incisor  
(Tooth G)**

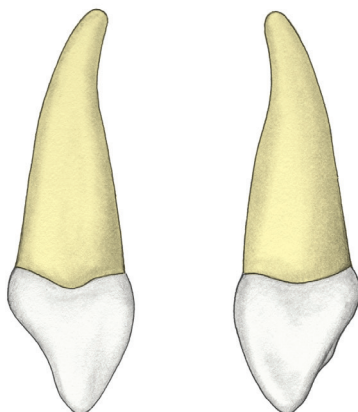
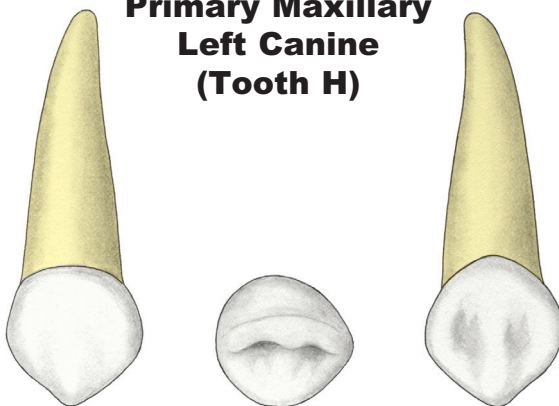


**Primary Maxillary Right  
Lateral Incisor  
(Tooth D)**

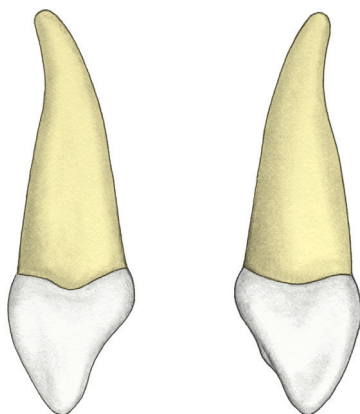
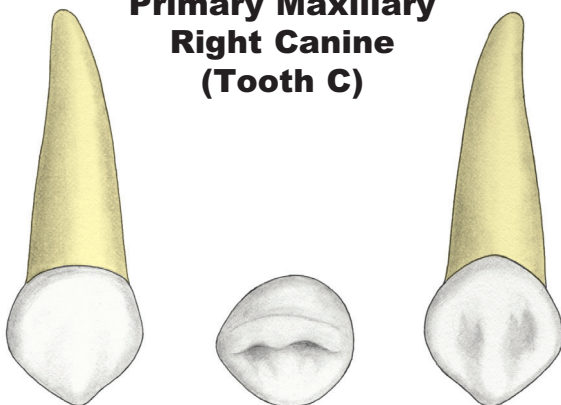




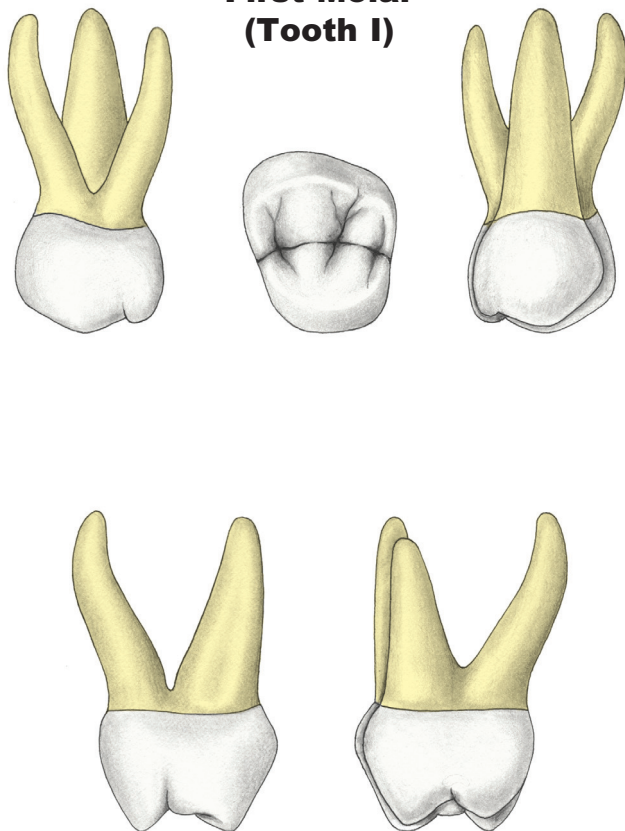
**Primary Maxillary  
Left Canine  
(Tooth H)**



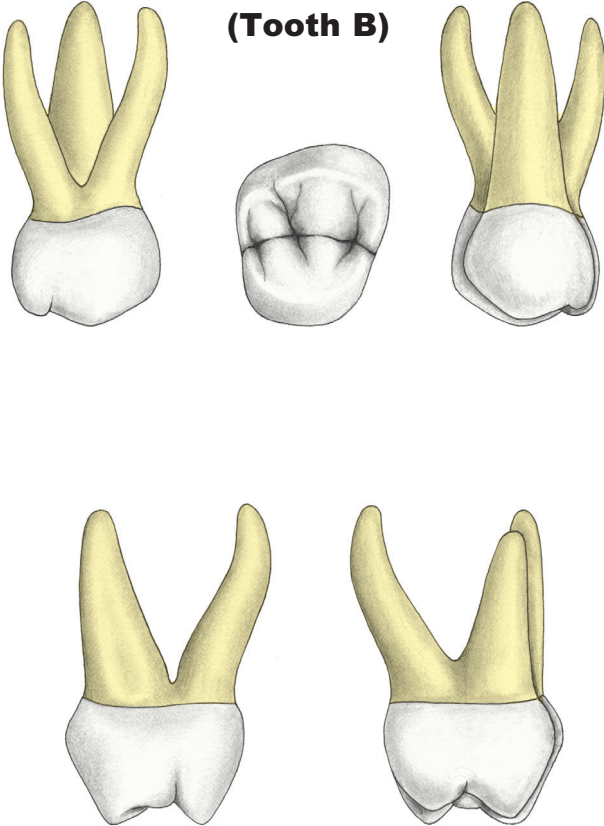
**Primary Maxillary  
Right Canine  
(Tooth C)**



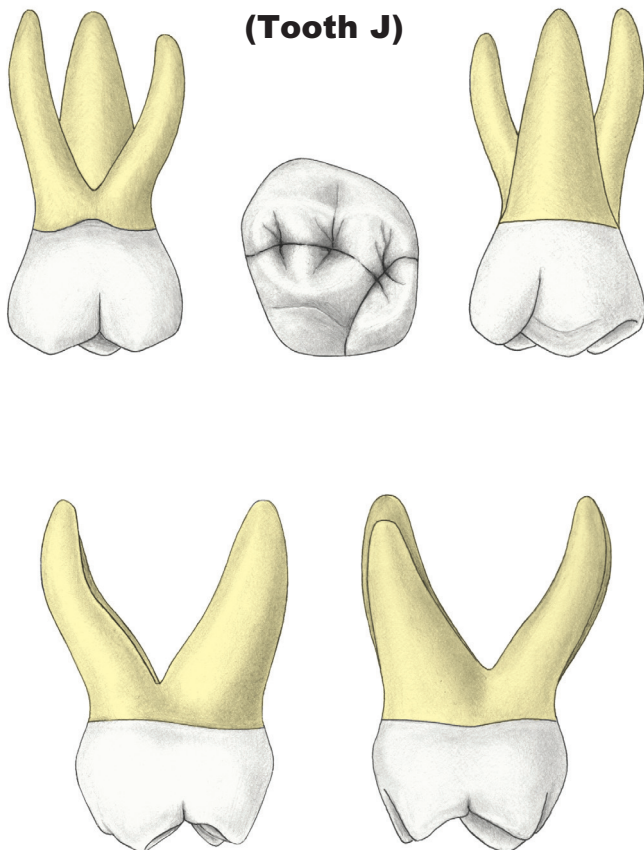
**Primary Maxillary Left  
First Molar  
(Tooth I)**



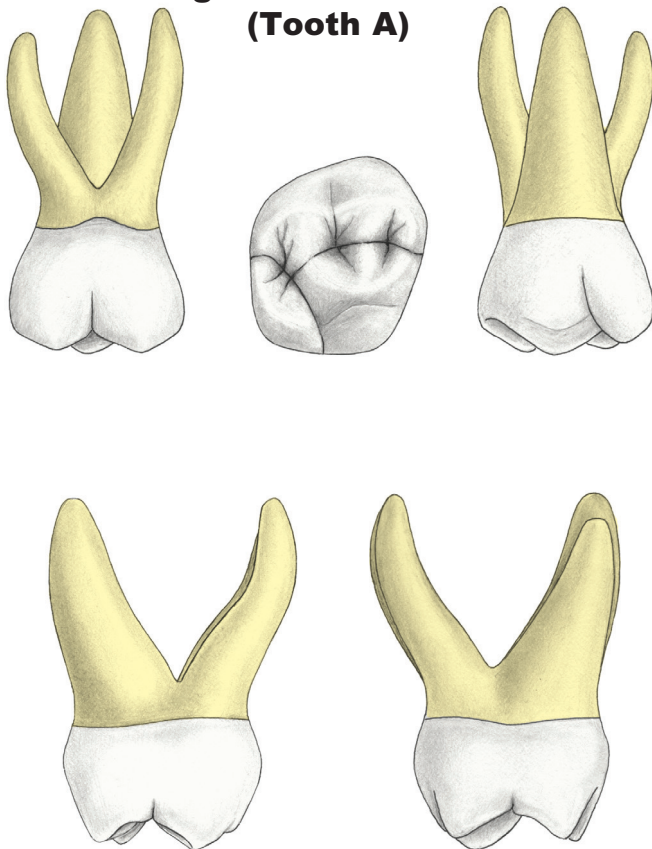
**Primary Maxillary Right  
First Molar  
(Tooth B)**



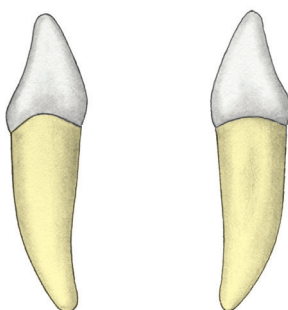
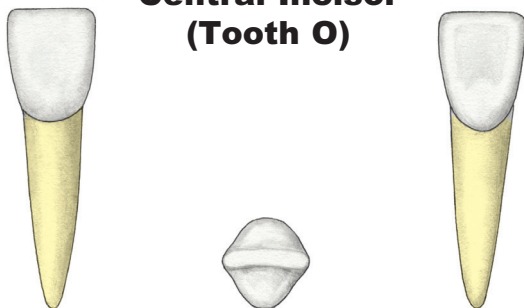
**Primary Maxillary  
Left Second Molar  
(Tooth J)**



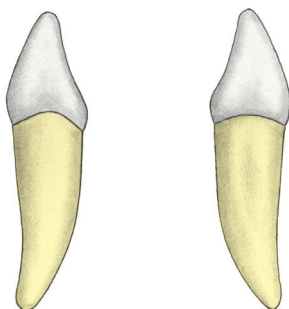
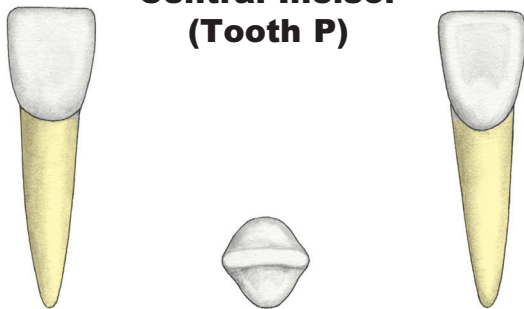
**Primary Maxillary  
Right Second Molar  
(Tooth A)**



**Primary Mandibular Left  
Central Incisor  
(Tooth 0)**

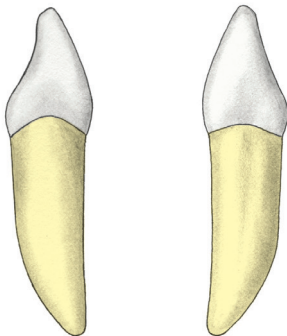
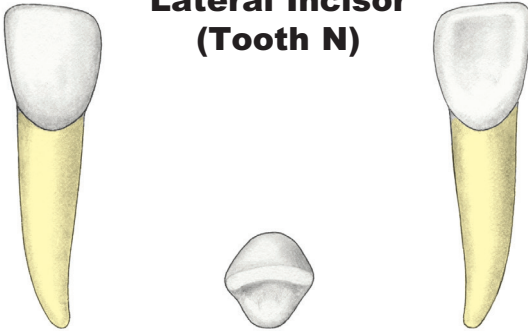


**Primary Mandibular Right  
Central Incisor  
(Tooth P)**

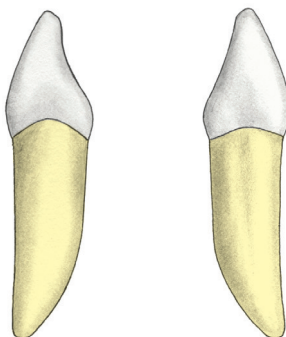
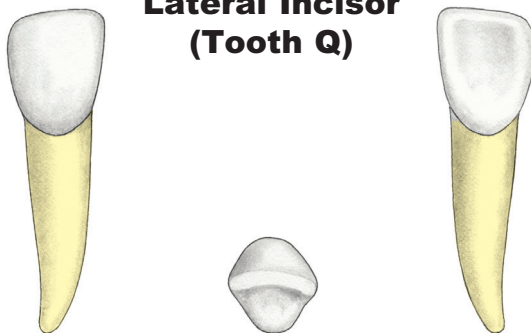




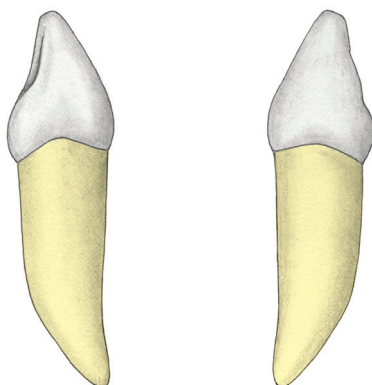
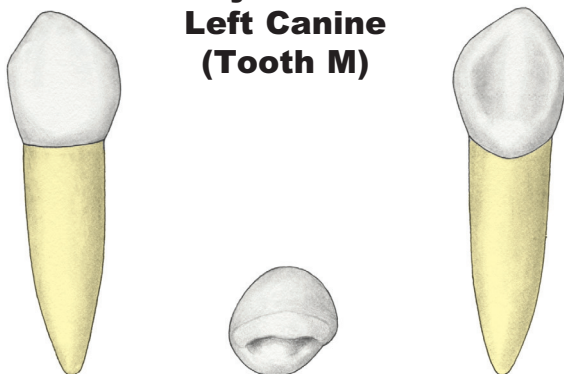
**Primary Mandibular Left  
Lateral Incisor  
(Tooth N)**



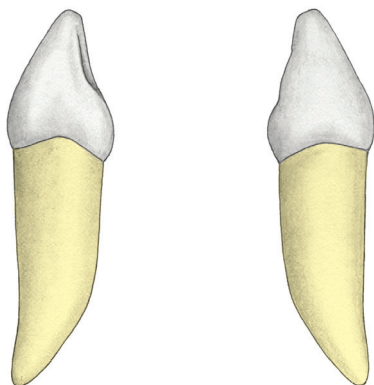
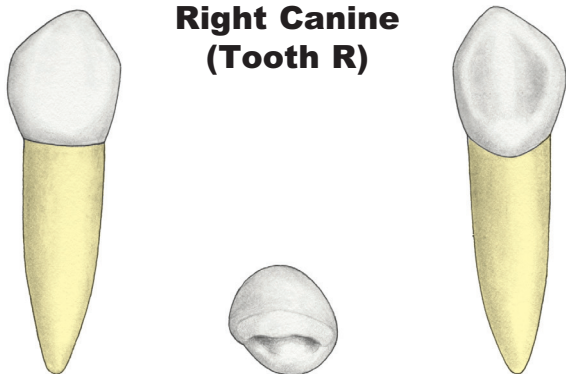
**Primary Mandibular Right  
Lateral Incisor  
(Tooth Q)**



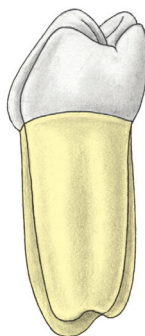
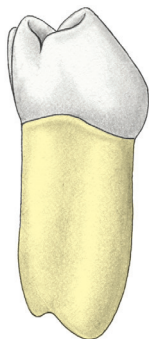
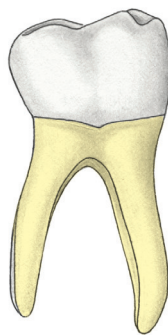
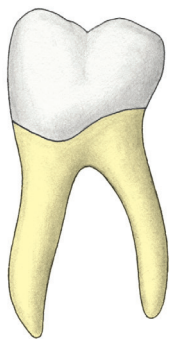
**Primary Mandibular  
Left Canine  
(Tooth M)**



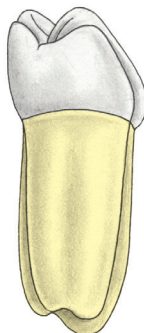
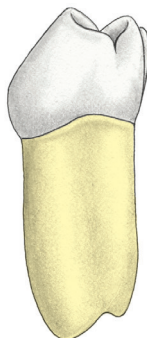
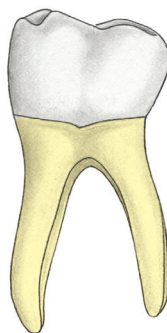
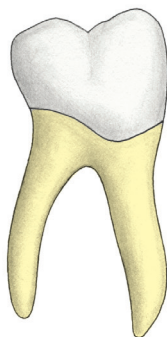
**Primary Mandibular  
Right Canine  
(Tooth R)**



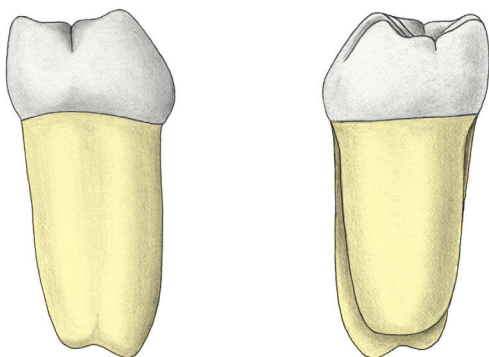
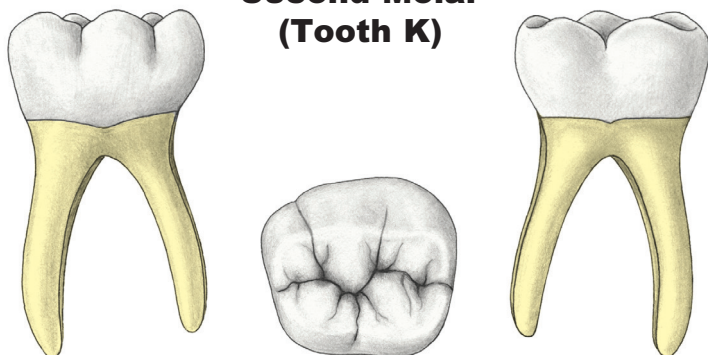
**Primary Mandibular Left  
First Molar  
(Tooth L)**



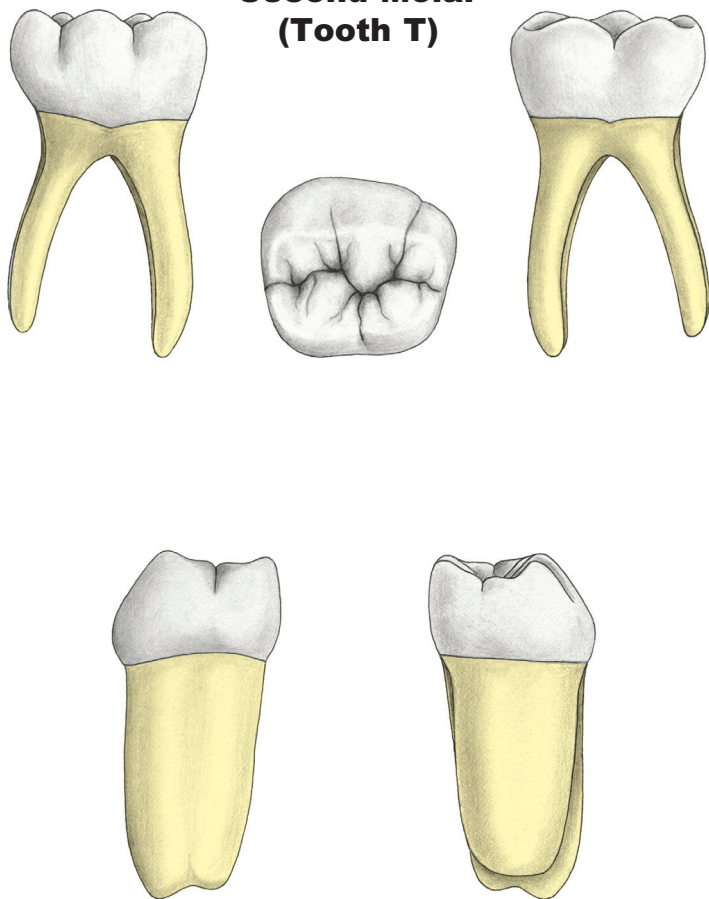
**Primary Mandibular Right  
First Molar  
(Tooth S)**



**Primary Mandibular Left  
Second Molar  
(Tooth K)**



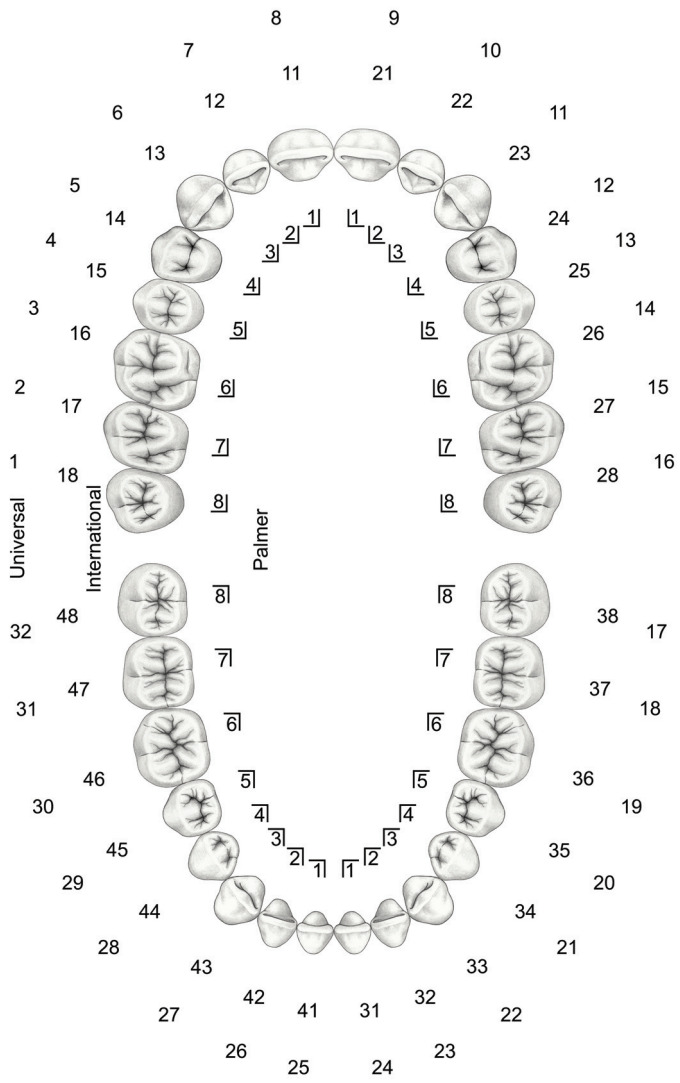
**Primary Mandibular Right  
Second Molar  
(Tooth T)**



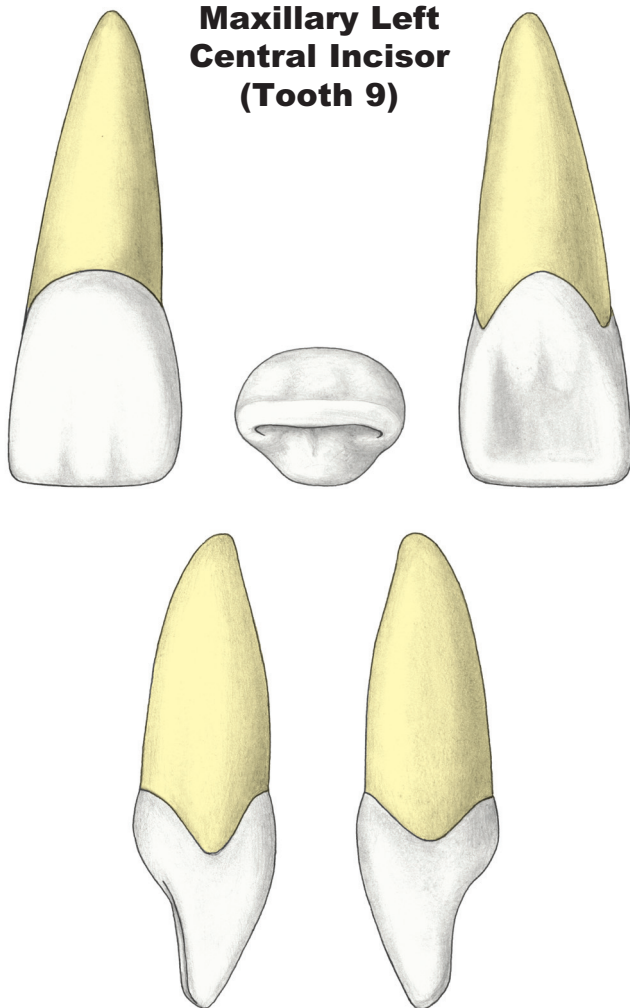


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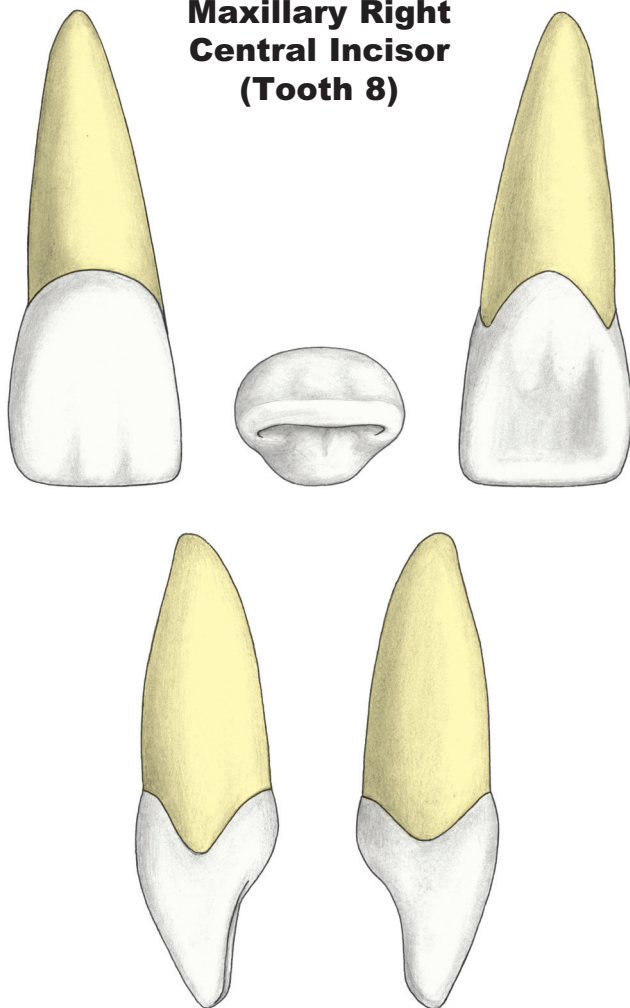
# Secondary Dentition



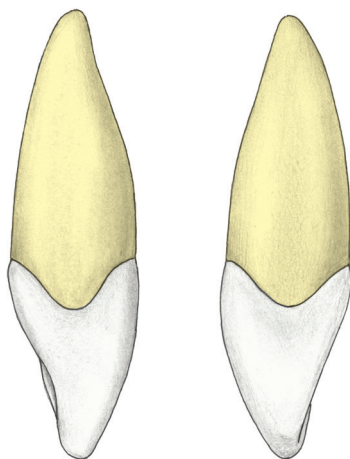
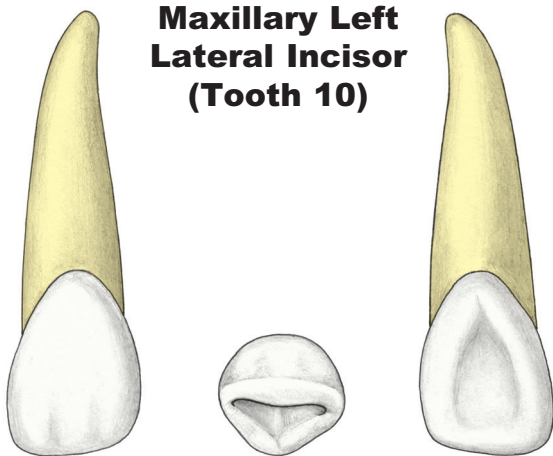
**Maxillary Left  
Central Incisor  
(Tooth 9)**



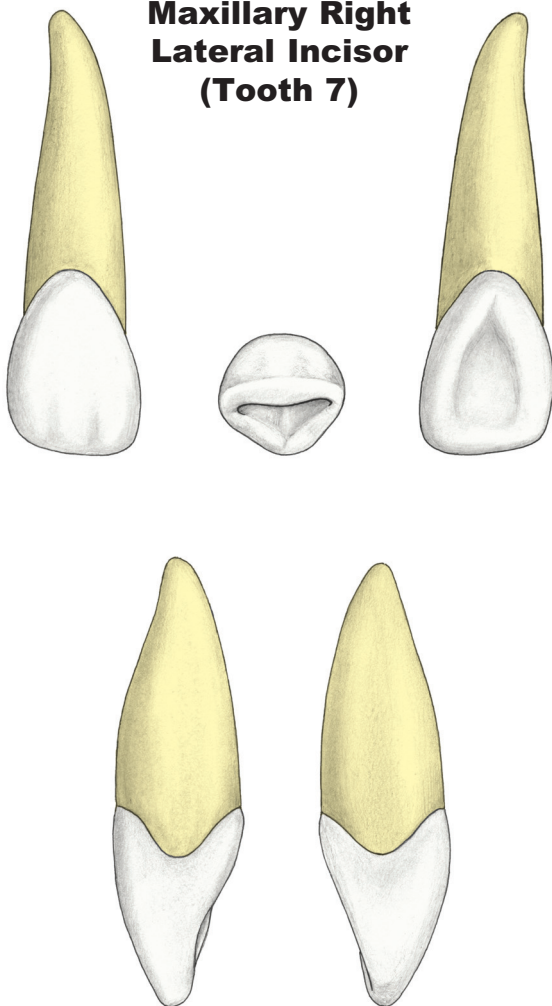
**Maxillary Right  
Central Incisor  
(Tooth 8)**



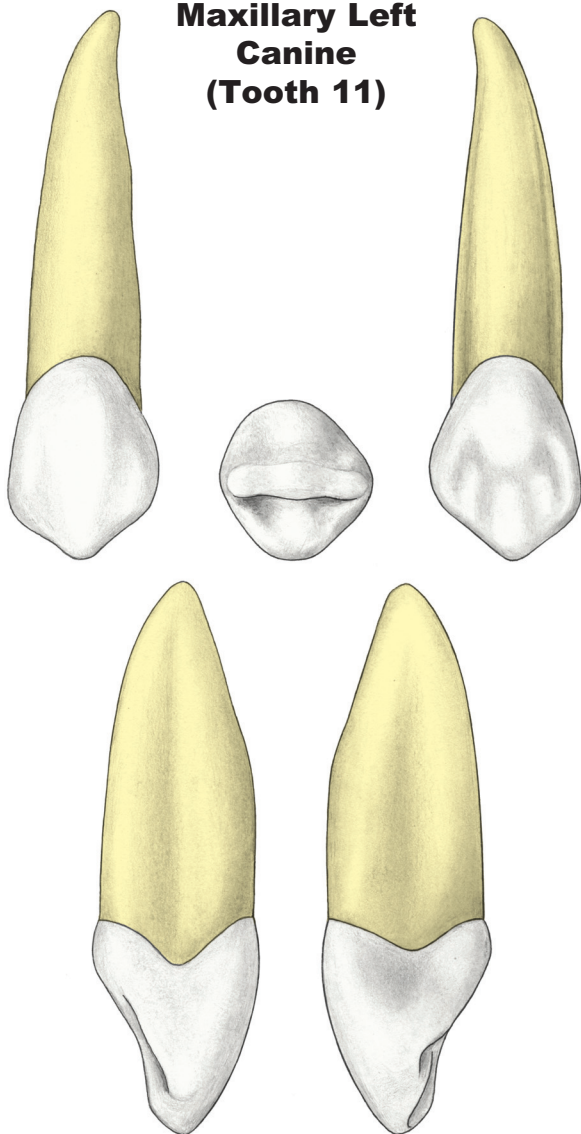
**Maxillary Left  
Lateral Incisor  
(Tooth 10)**



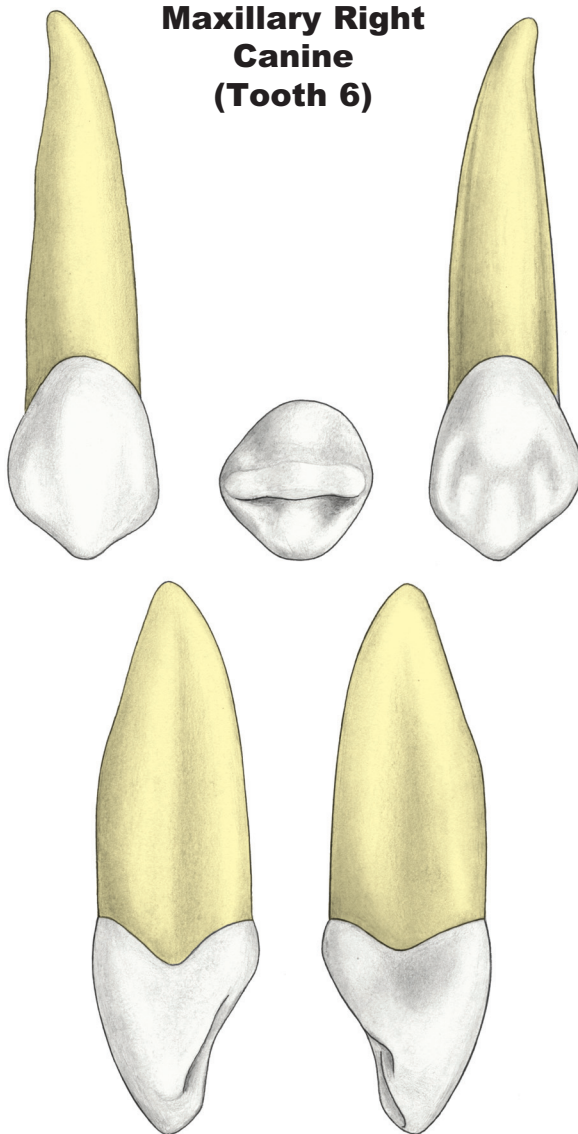
**Maxillary Right  
Lateral Incisor  
(Tooth 7)**



**Maxillary Left  
Canine  
(Tooth 11)**

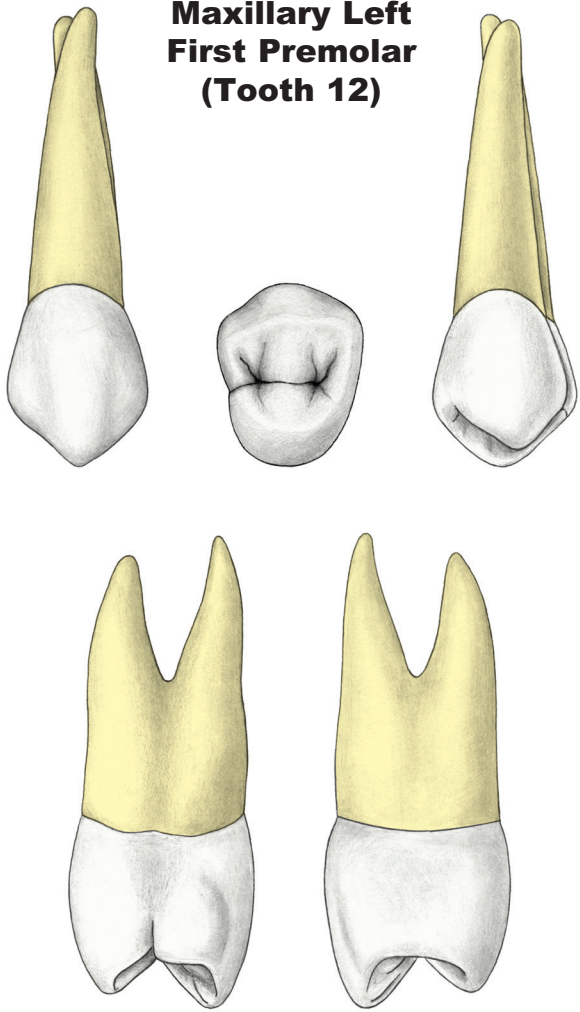


**Maxillary Right  
Canine  
(Tooth 6)**

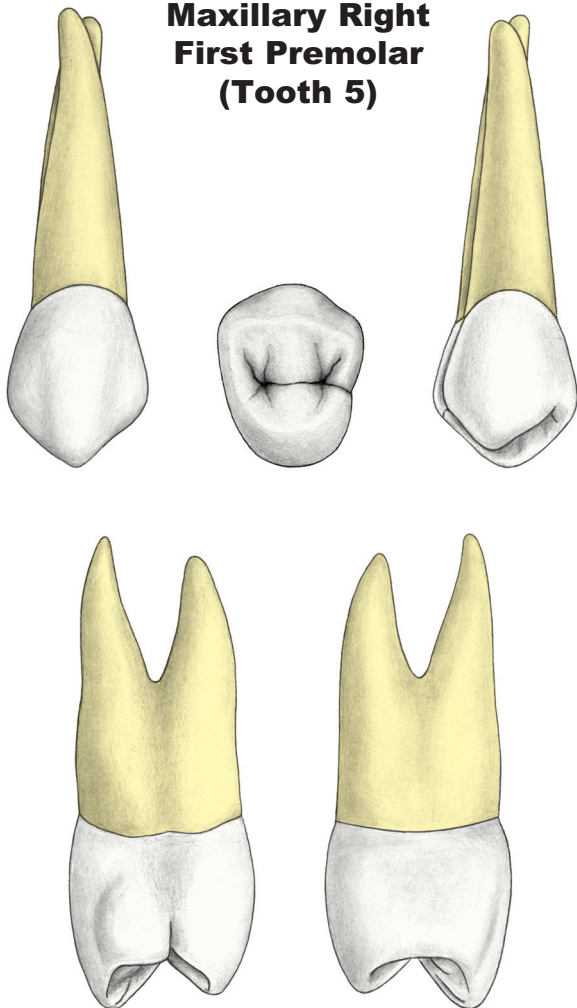




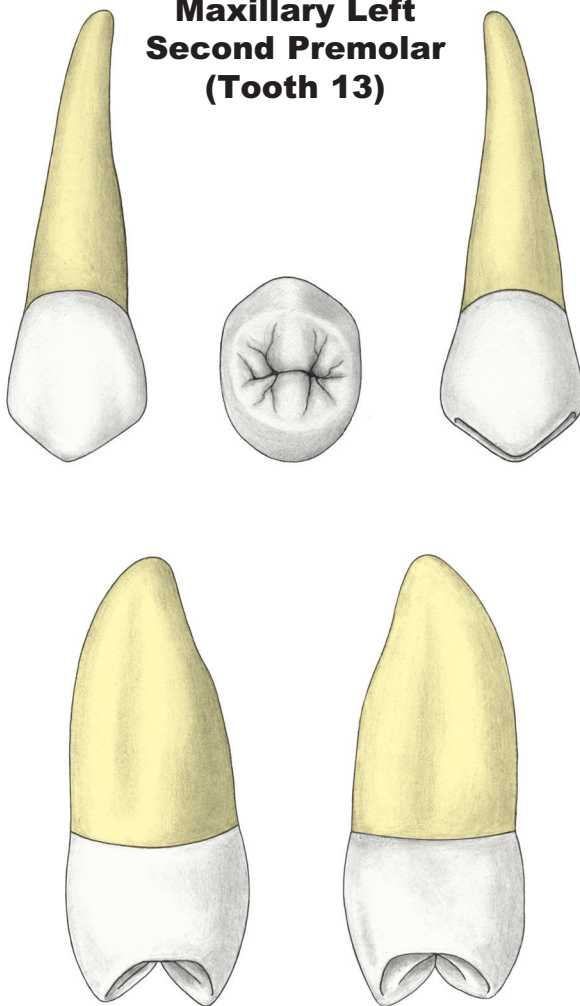
**Maxillary Left  
First Premolar  
(Tooth 12)**



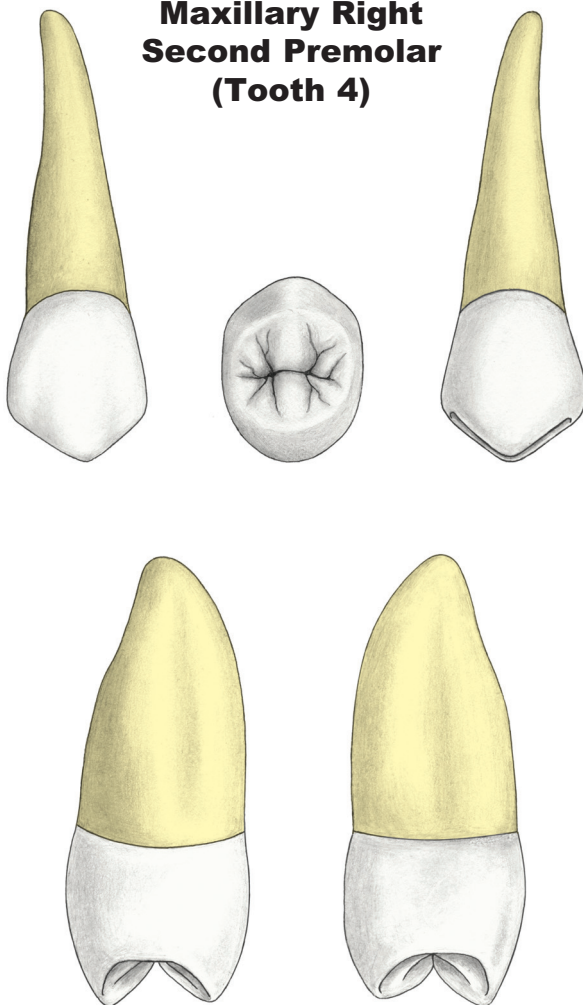
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First Premolar  
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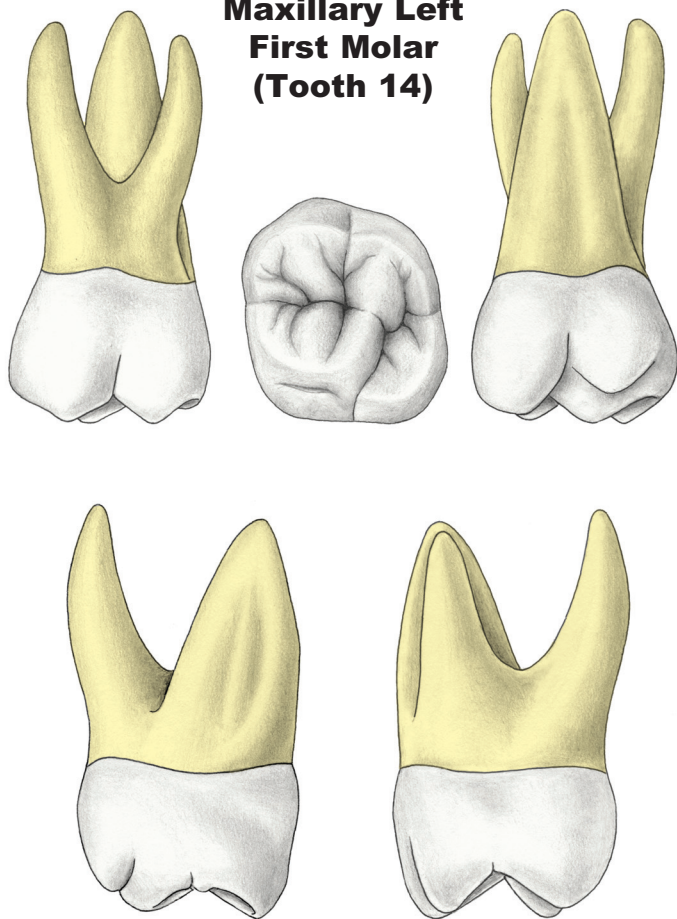
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Second Premolar  
(Tooth 13)**



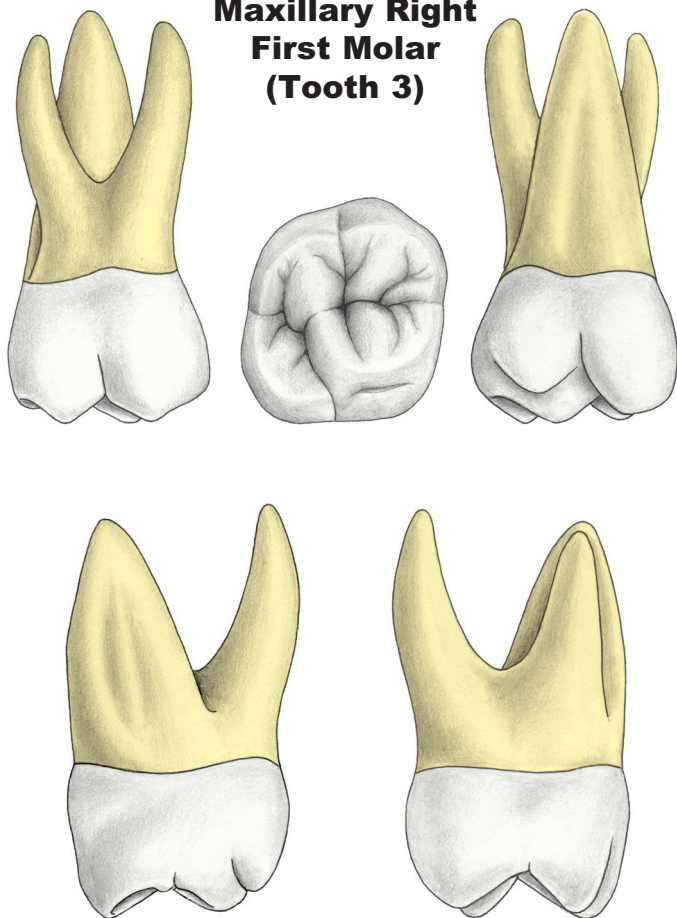
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(Tooth 4)**



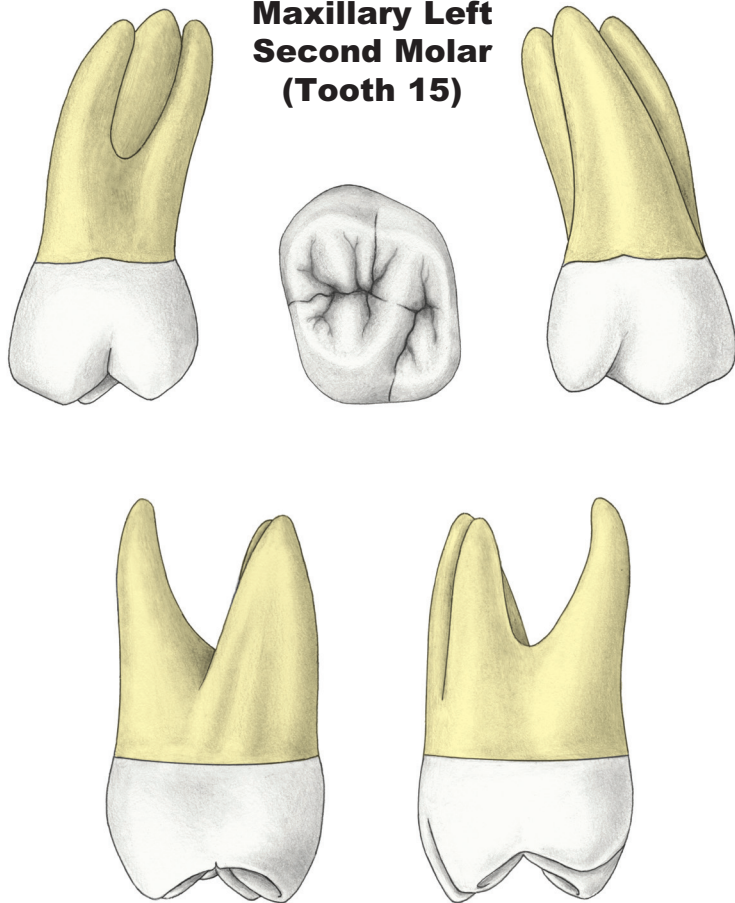
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(Tooth 14)**



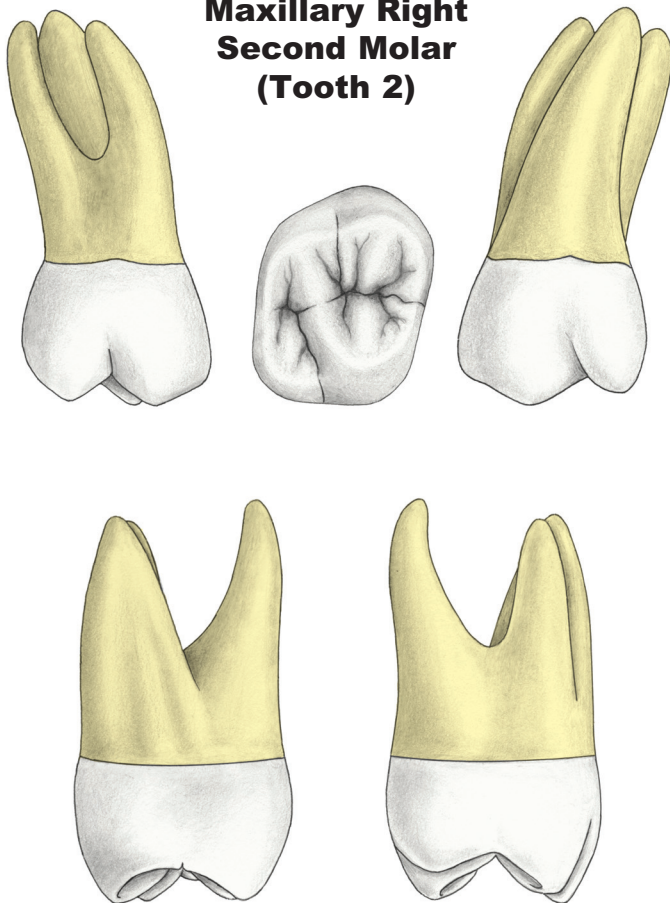
**Maxillary Right  
First Molar  
(Tooth 3)**



**Maxillary Left  
Second Molar  
(Tooth 15)**

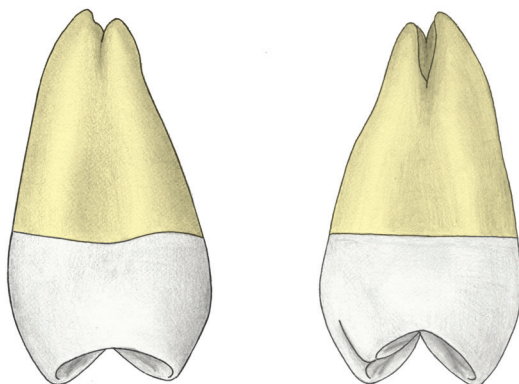
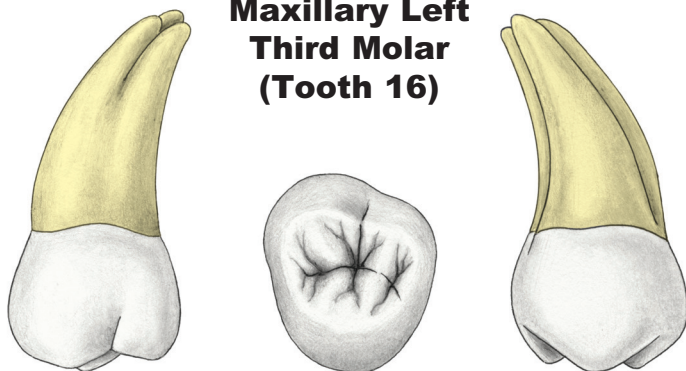


**Maxillary Right  
Second Molar  
(Tooth 2)**

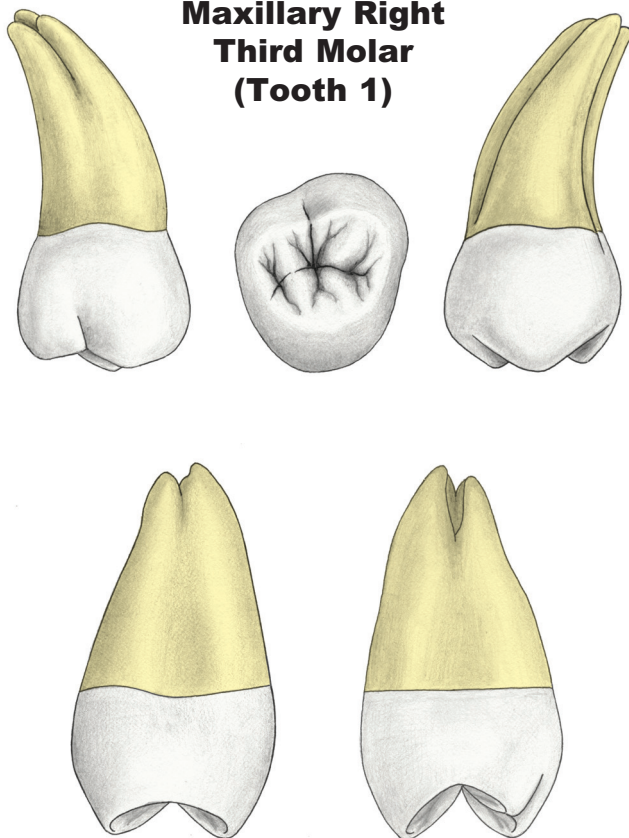




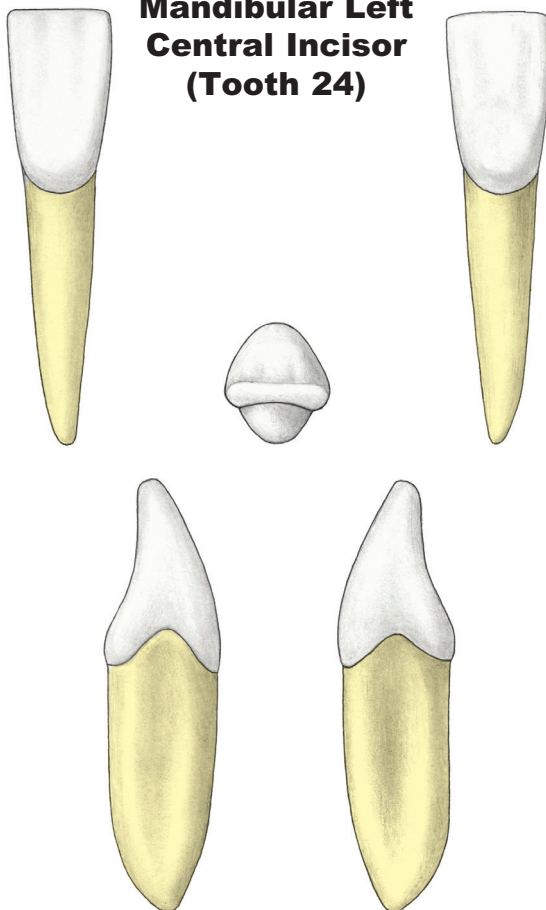
**Maxillary Left  
Third Molar  
(Tooth 16)**



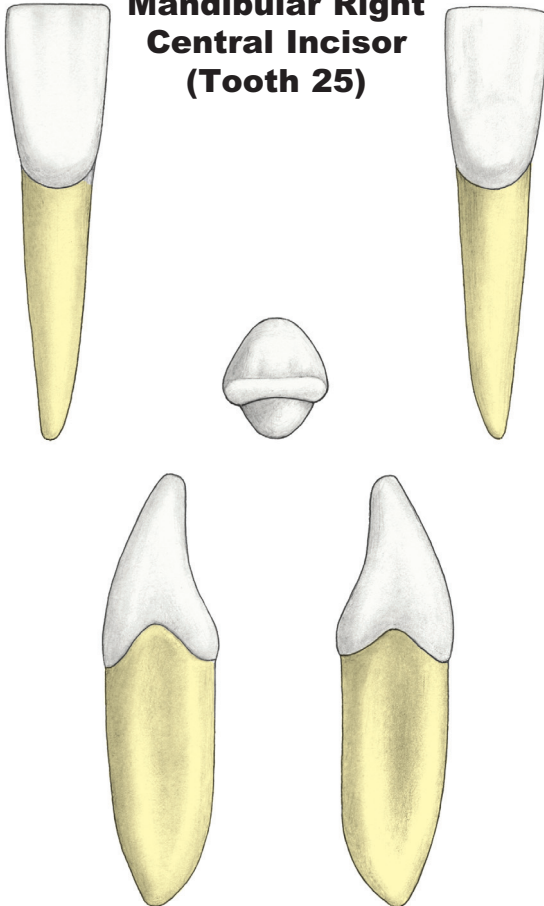
**Maxillary Right  
Third Molar  
(Tooth 1)**



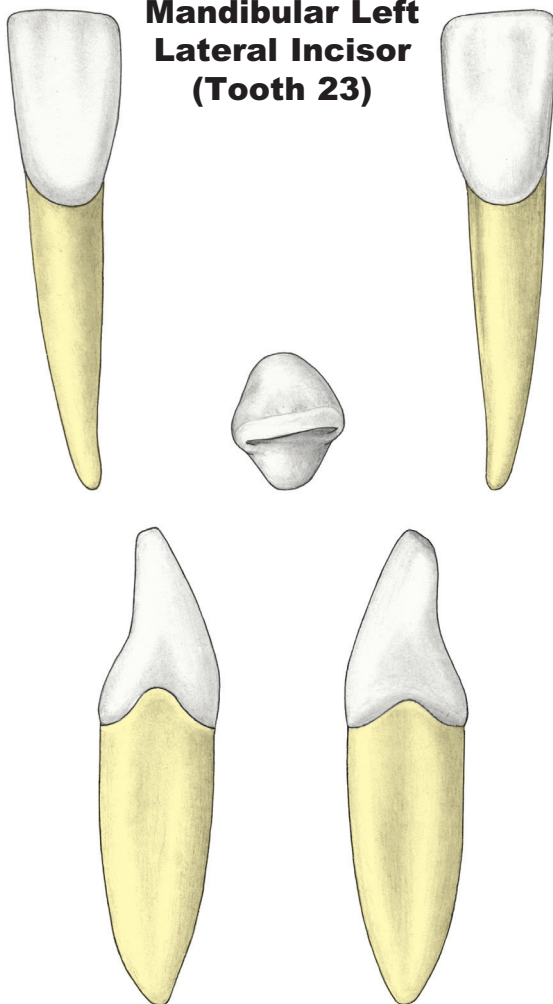
**Mandibular Left  
Central Incisor  
(Tooth 24)**



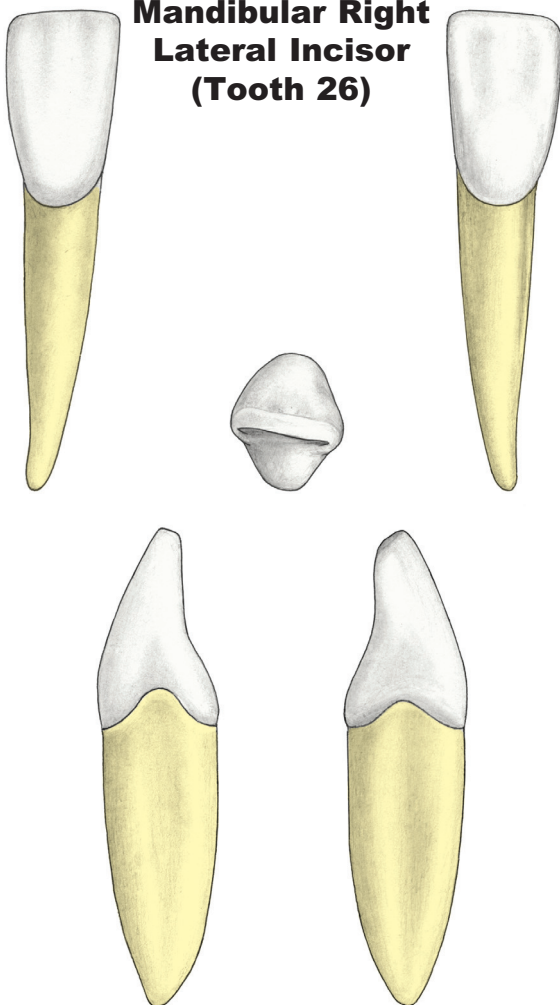
**Mandibular Right  
Central Incisor  
(Tooth 25)**



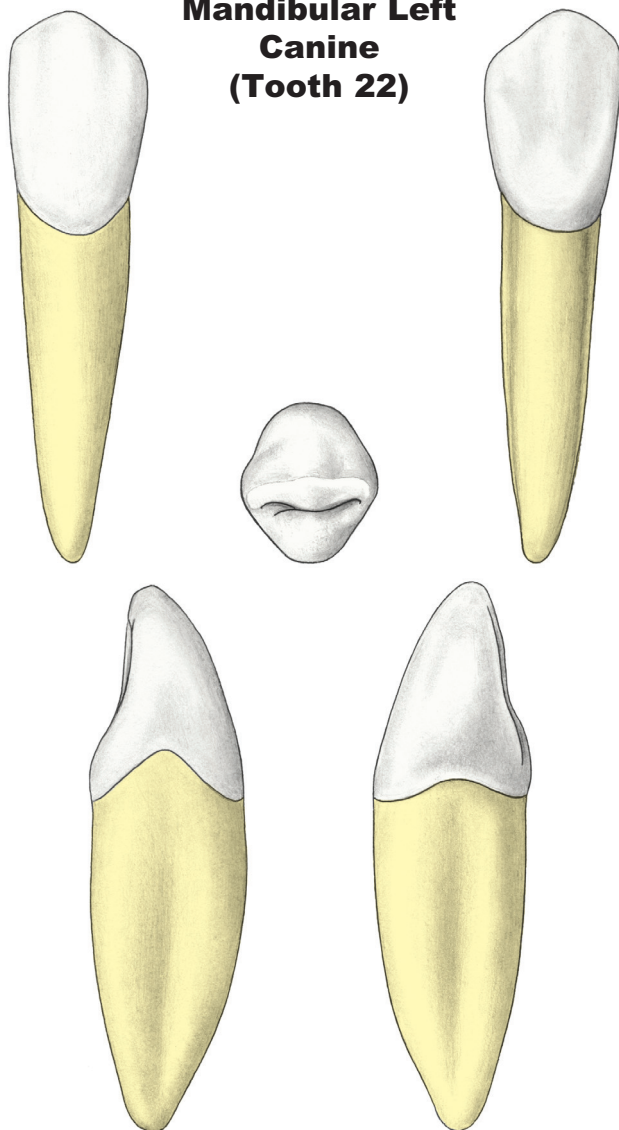
**Mandibular Left  
Lateral Incisor  
(Tooth 23)**



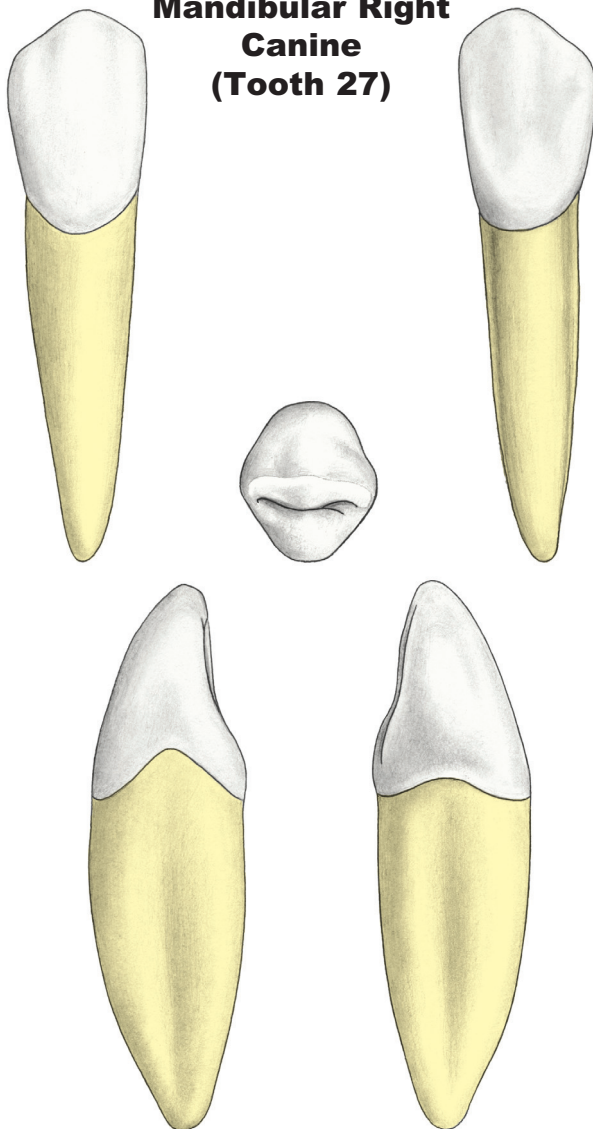
**Mandibular Right  
Lateral Incisor  
(Tooth 26)**



**Mandibular Left  
Canine  
(Tooth 22)**

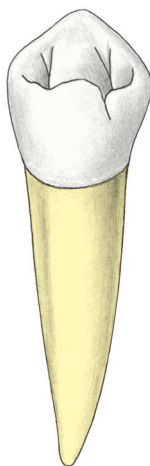
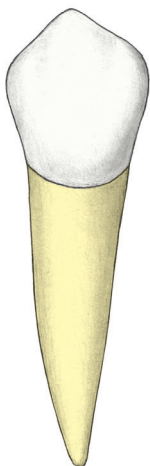


**Mandibular Right  
Canine  
(Tooth 27)**

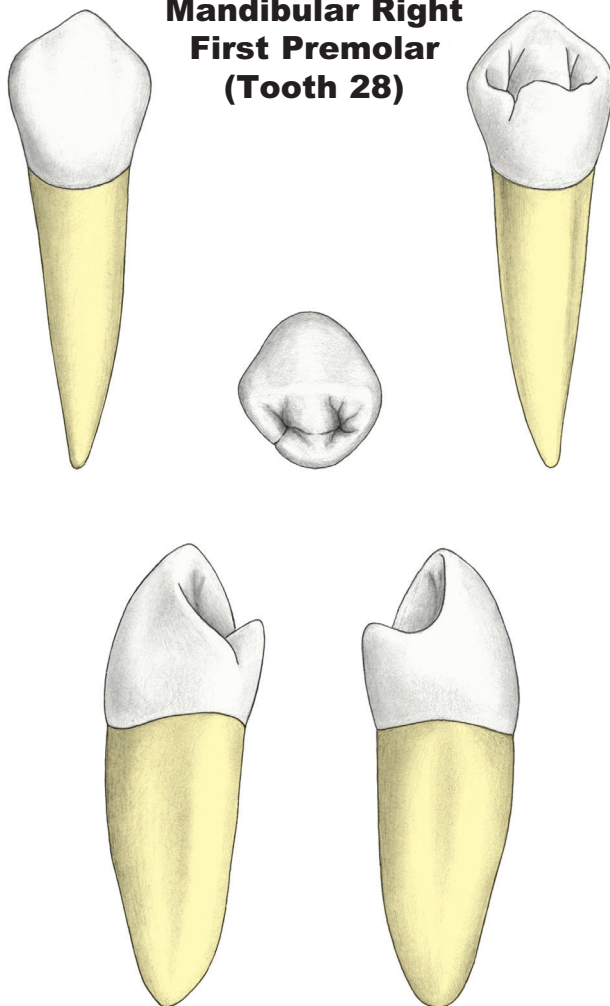




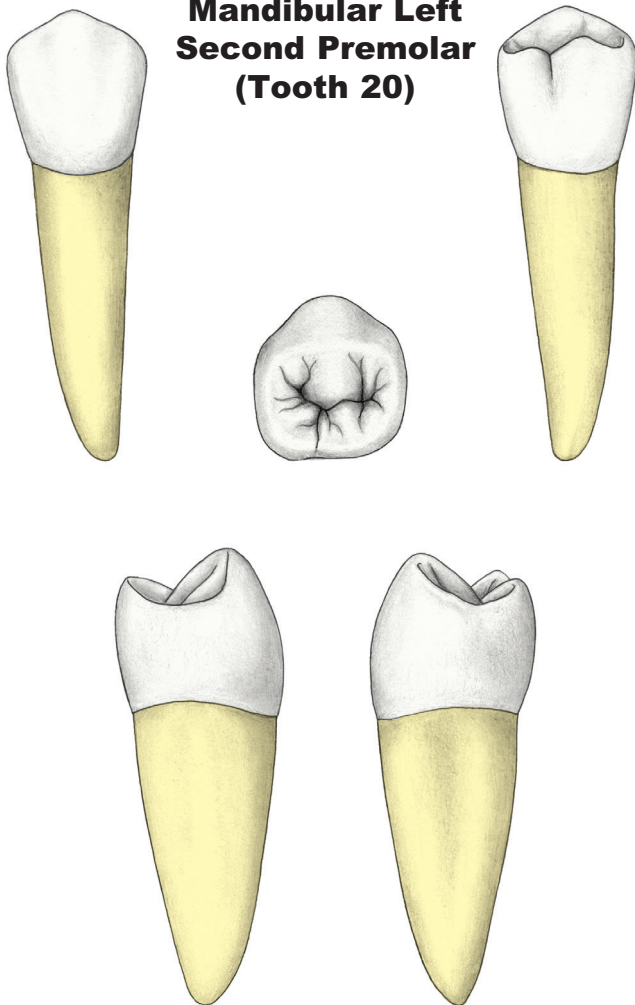
**Mandibular Left  
First Premolar  
(Tooth 21)**



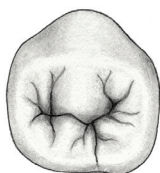
**Mandibular Right  
First Premolar  
(Tooth 28)**



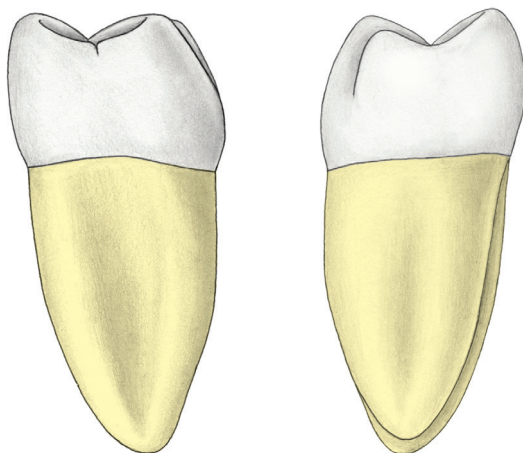
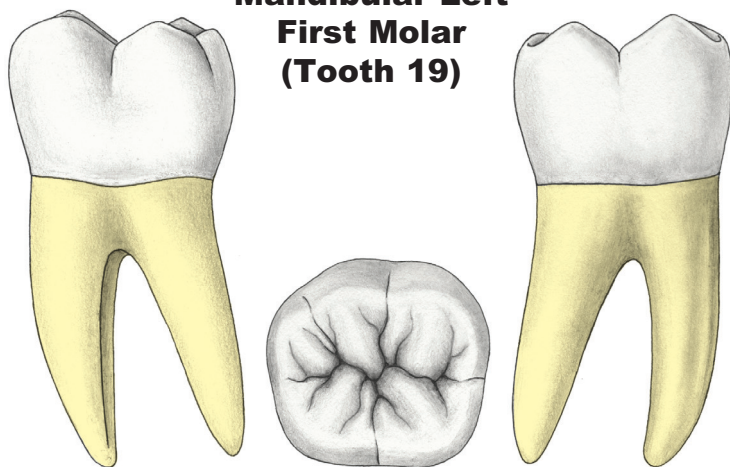
**Mandibular Left  
Second Premolar  
(Tooth 20)**



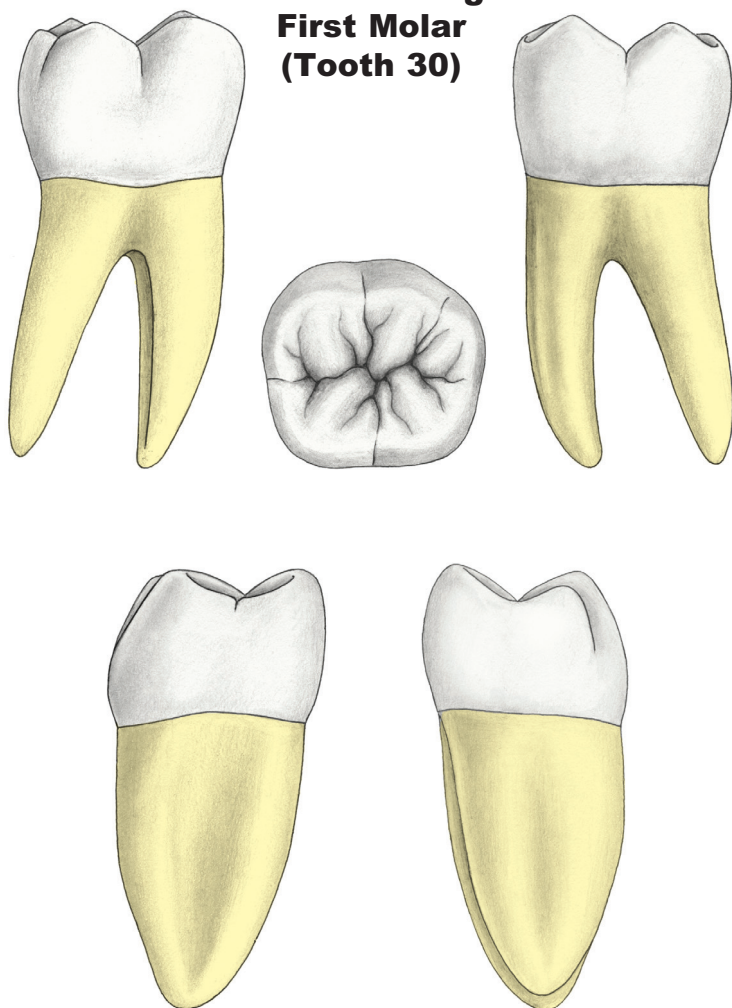
**Mandibular Right  
Second Premolar  
(Tooth 29)**



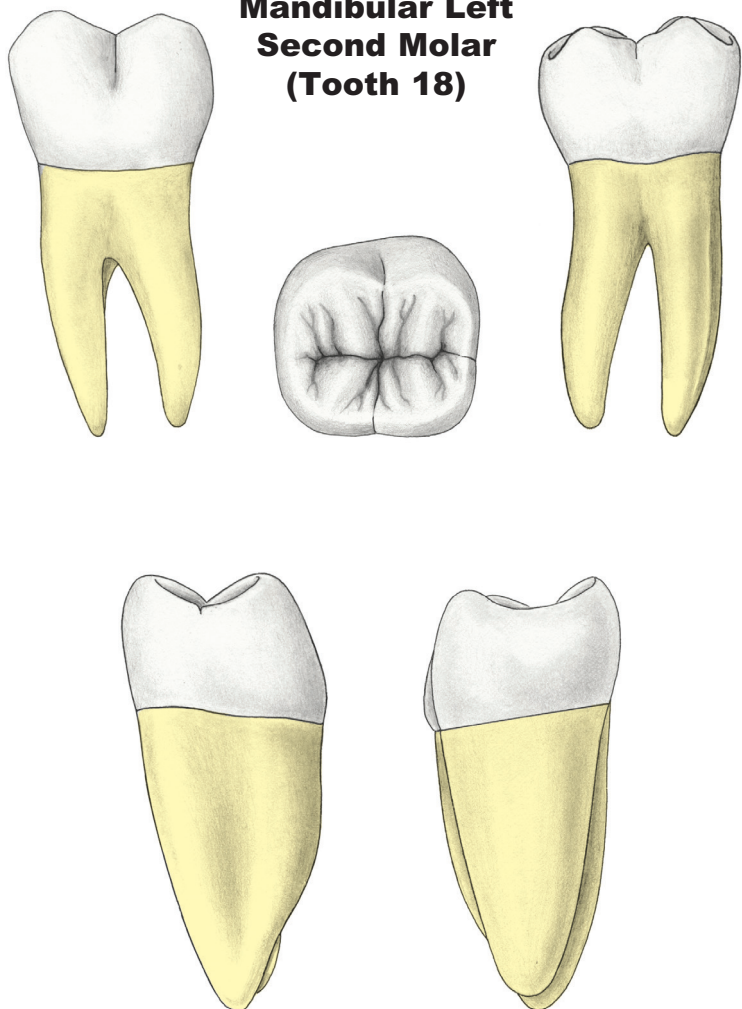
**Mandibular Left  
First Molar  
(Tooth 19)**



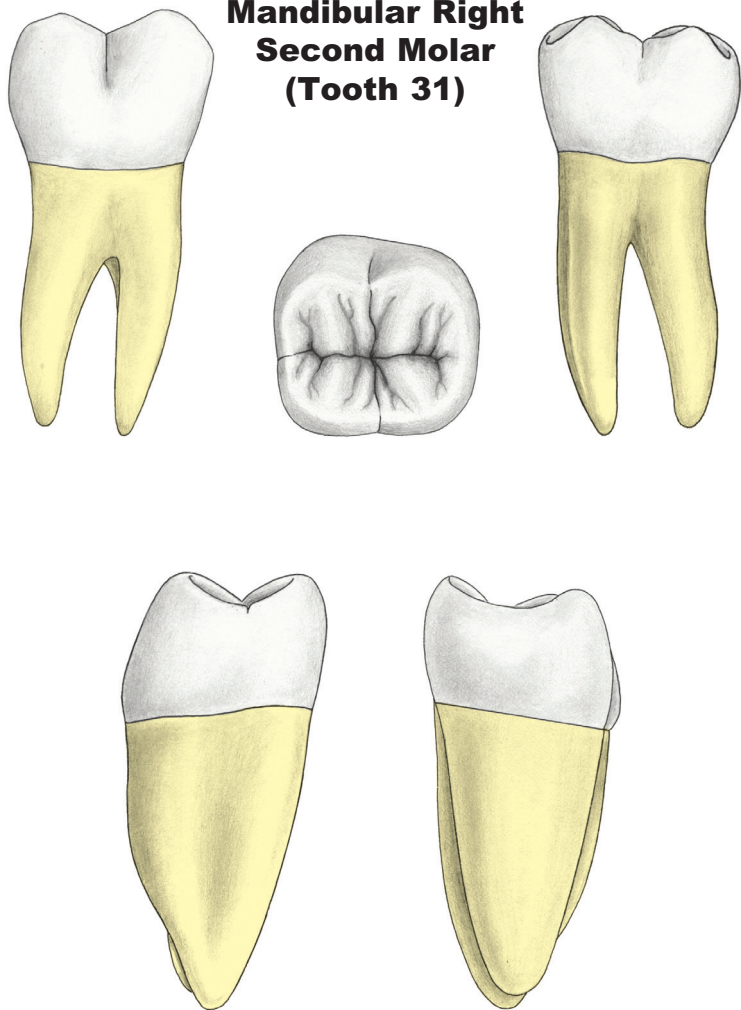
**Mandibular Right  
First Molar  
(Tooth 30)**



**Mandibular Left  
Second Molar  
(Tooth 18)**

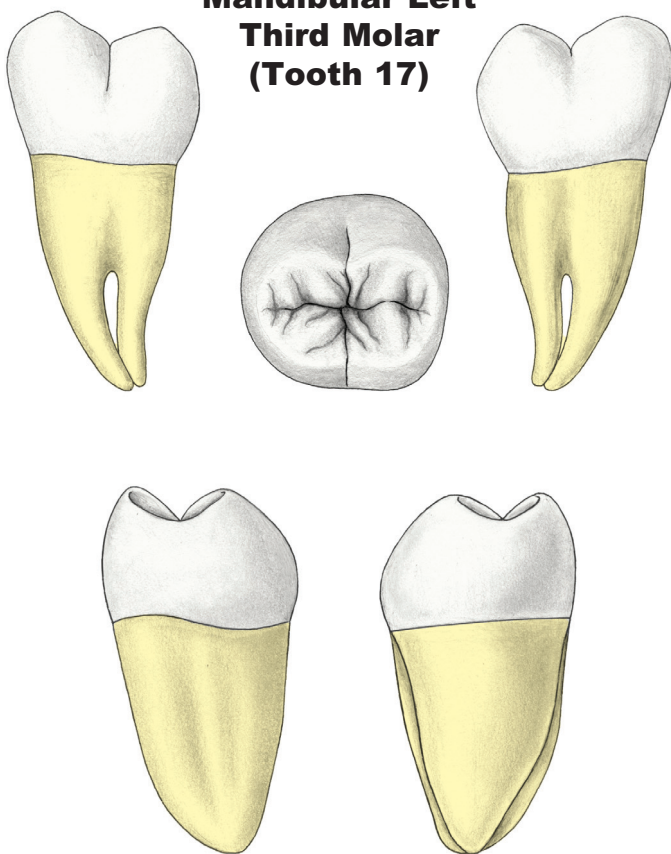


**Mandibular Right  
Second Molar  
(Tooth 31)**

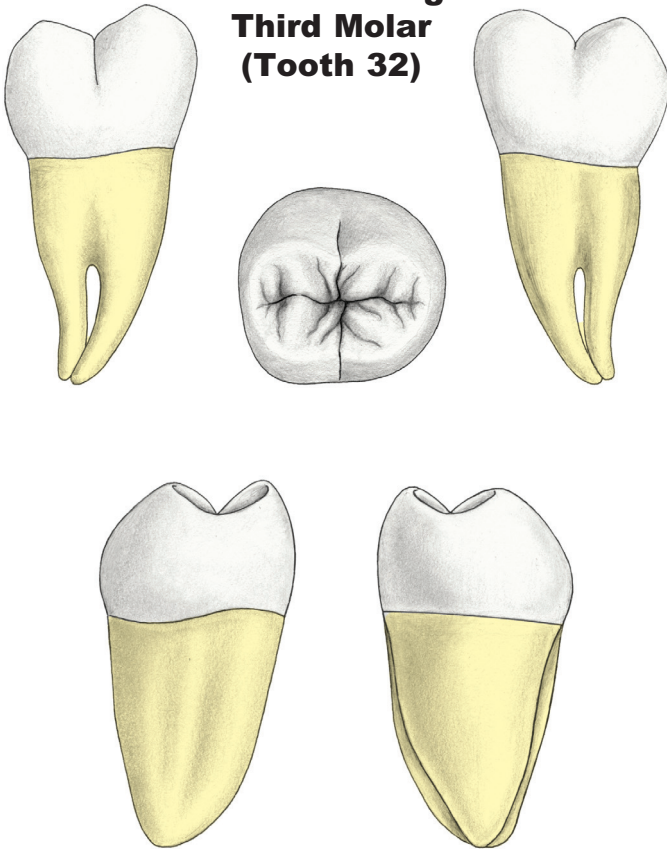




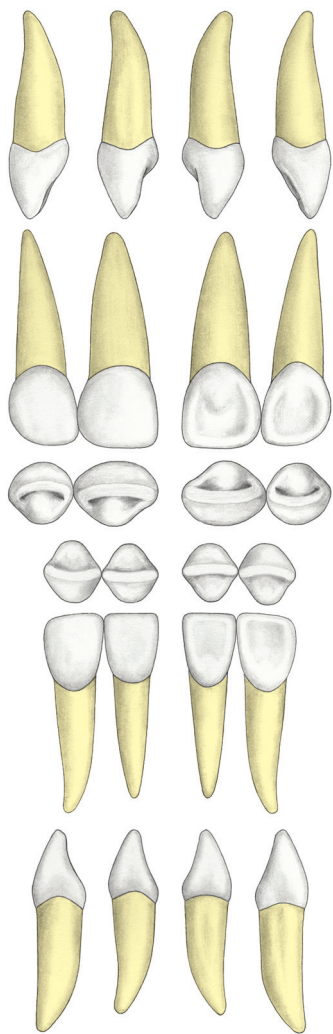
**Mandibular Left  
Third Molar  
(Tooth 17)**



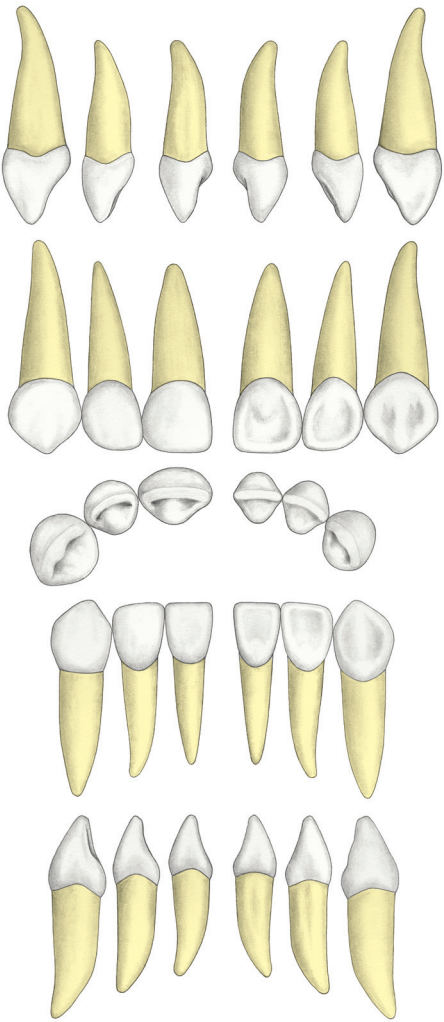
**Mandibular Right  
Third Molar  
(Tooth 32)**



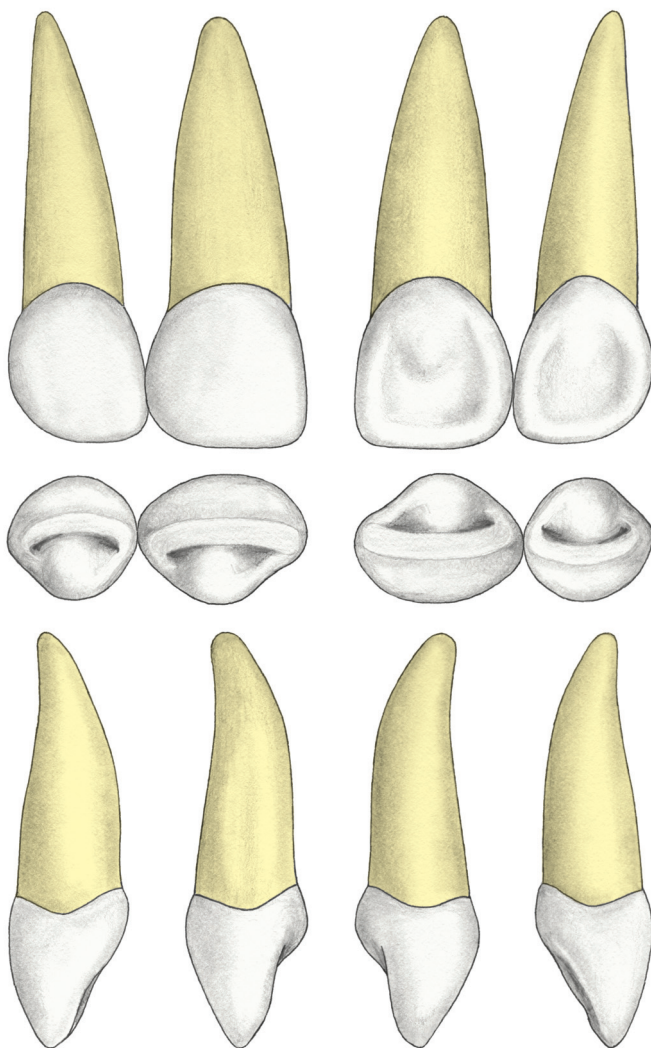
## Primary Maxillary and Mandibular Incisors



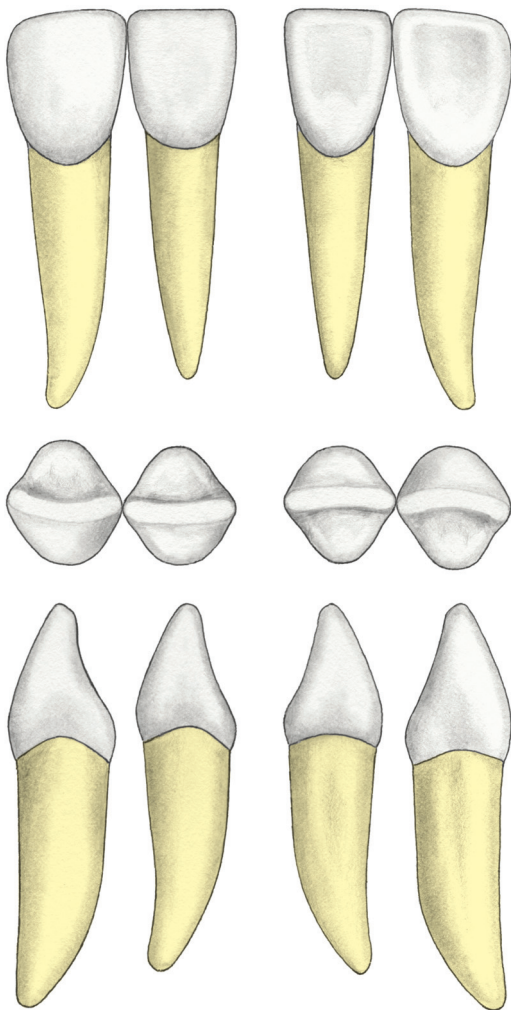
**Primary Canines and Incisors**



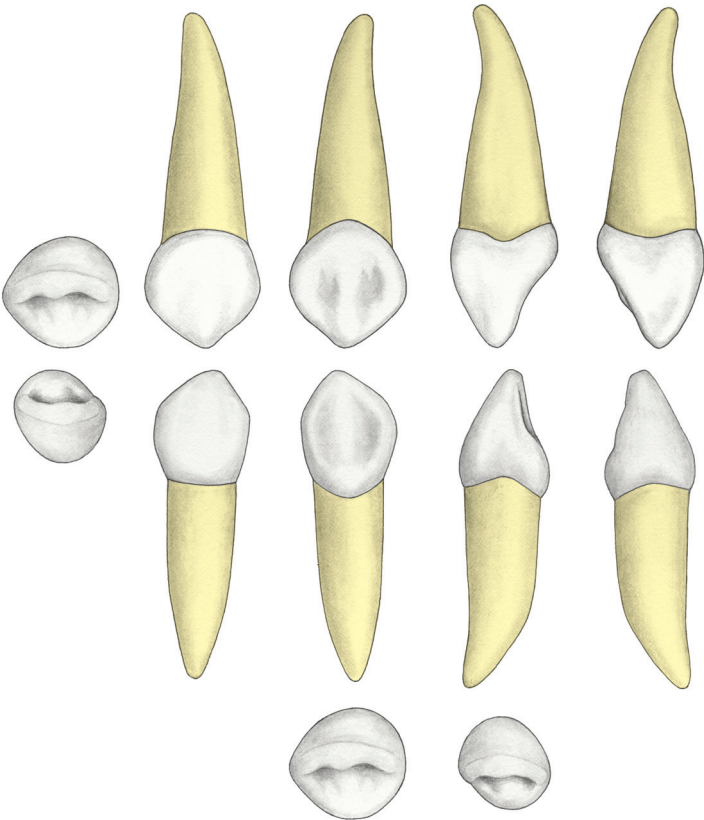
## Primary Maxillary Central and Lateral Incisors



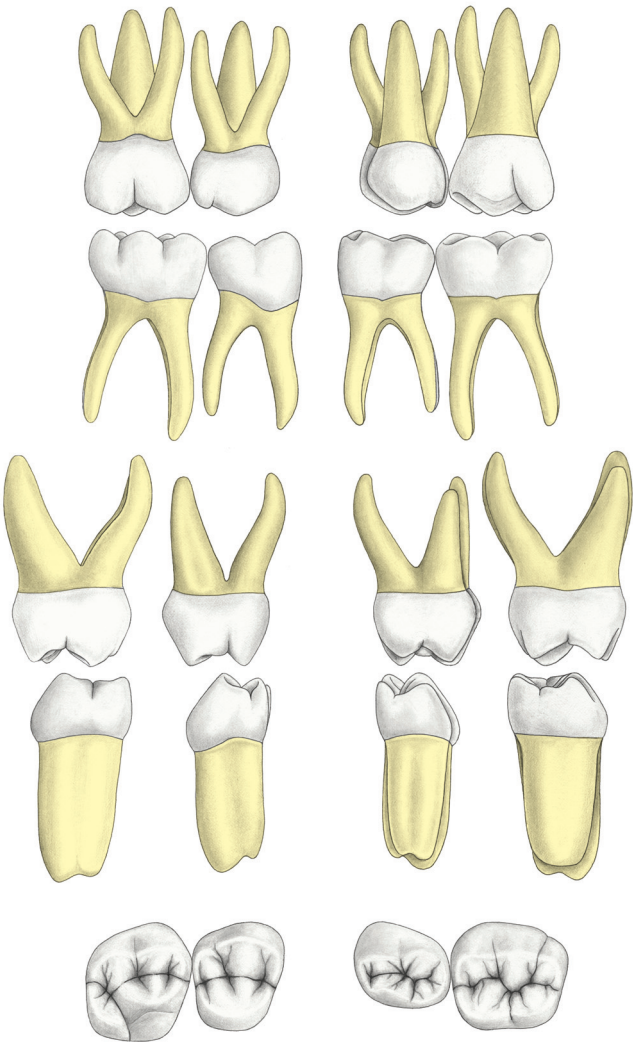
## **Primary Mandibular Central and Lateral Incisors**



**Primary Maxillary and Mandibular Canines**

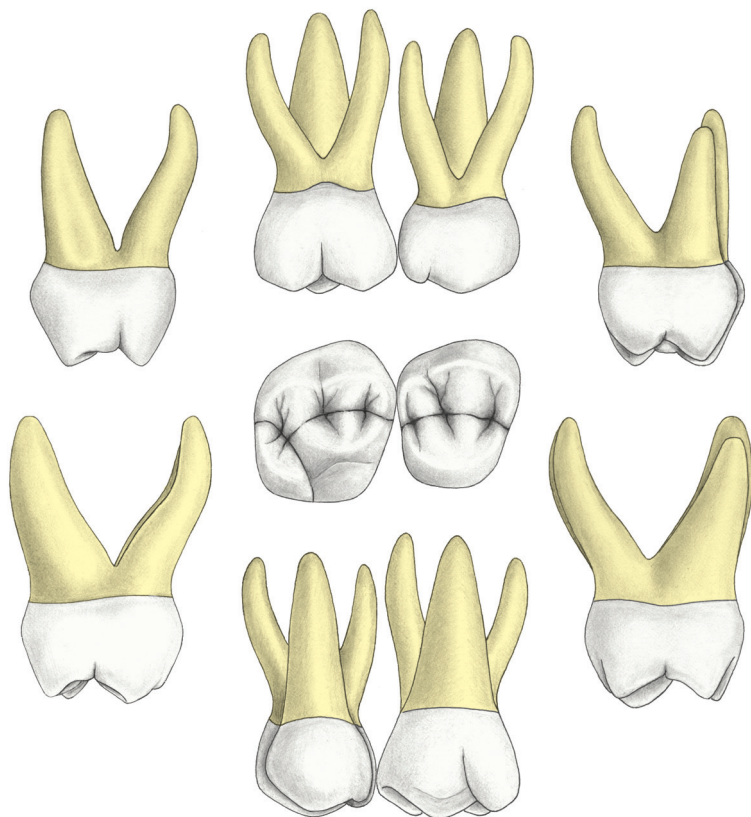


**Primary Maxillary and Mandibular Molars**

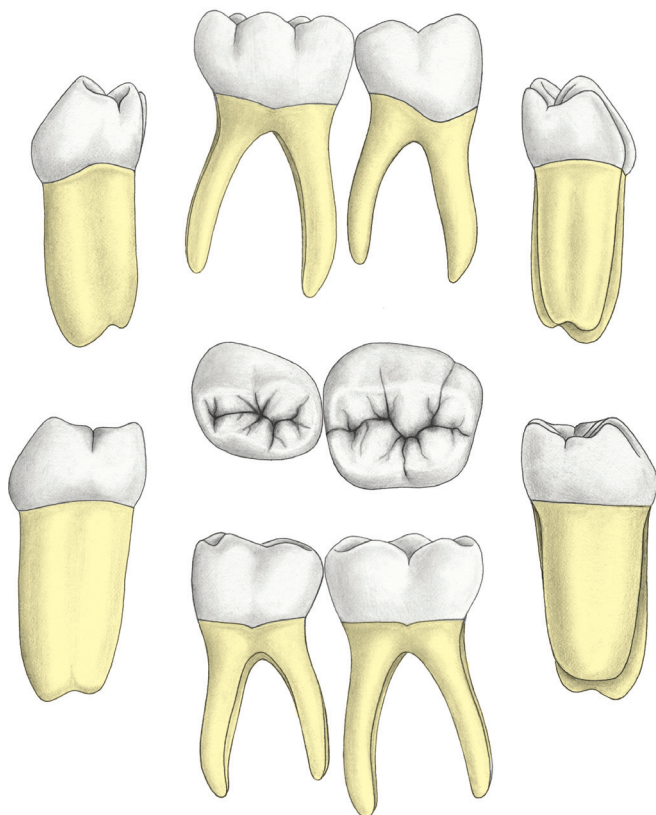




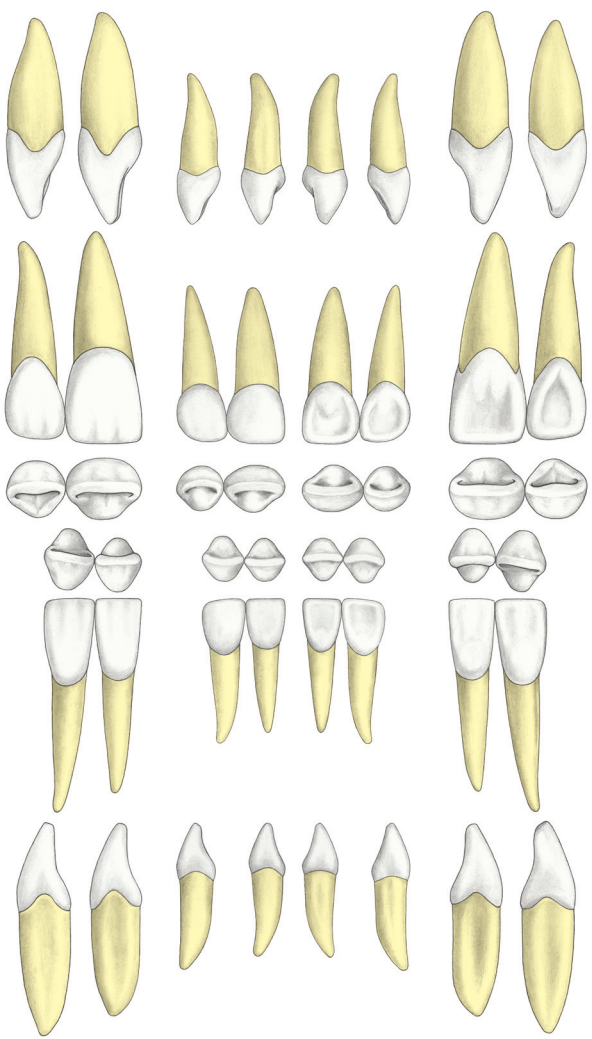
# Primary Maxillary 1st and 2nd Molars



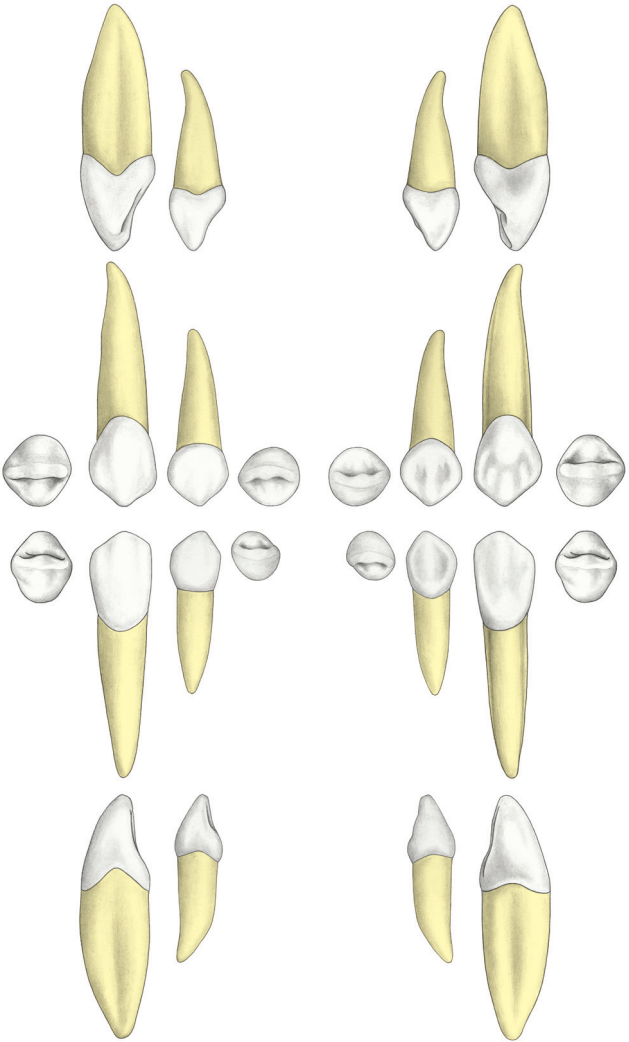
## Primary Mandibular 1st and 2nd Molars



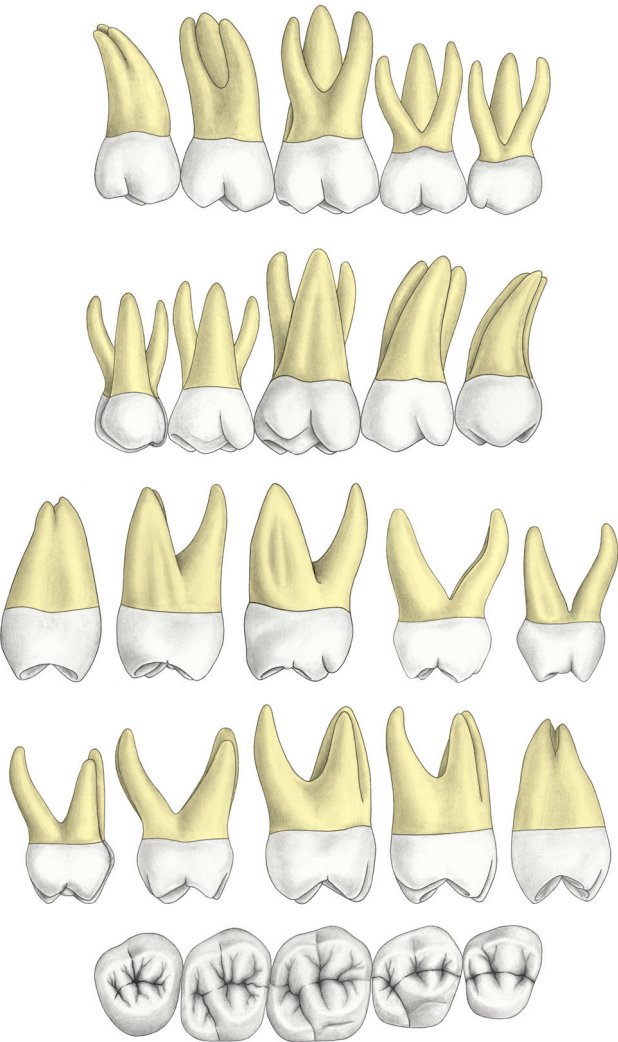
**Primary and Secondary Incisors**



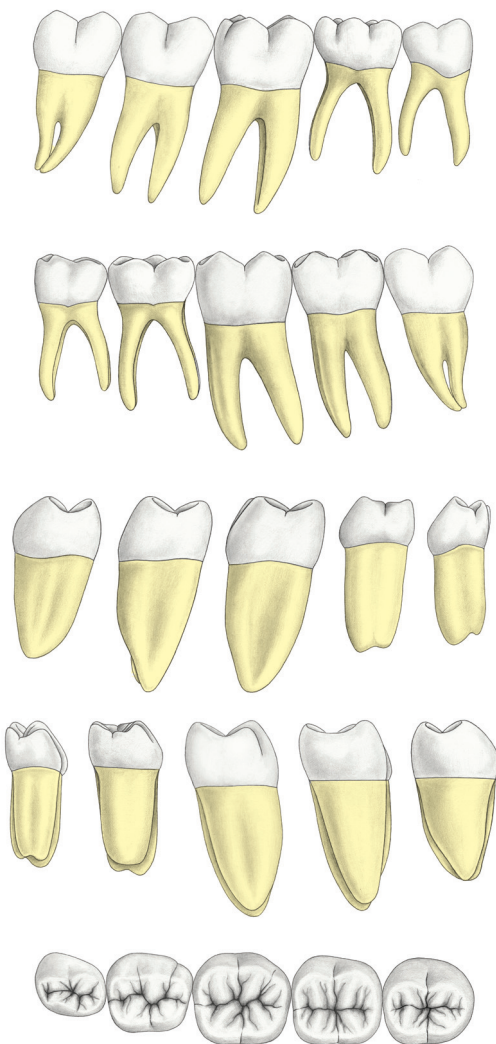
**Primary and Secondary Canines**



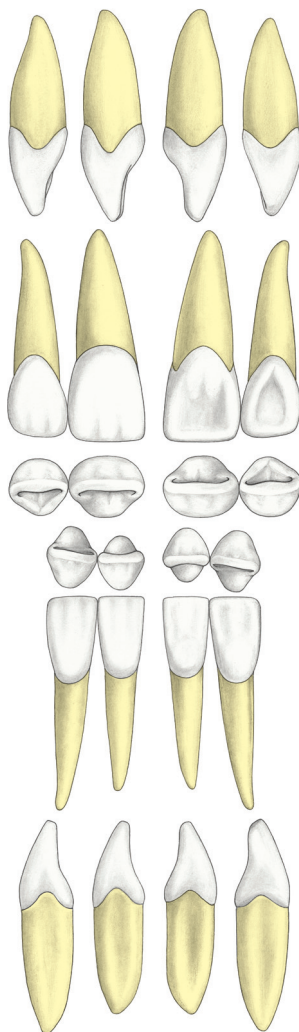
**Primary and Secondary Maxillary Molars**



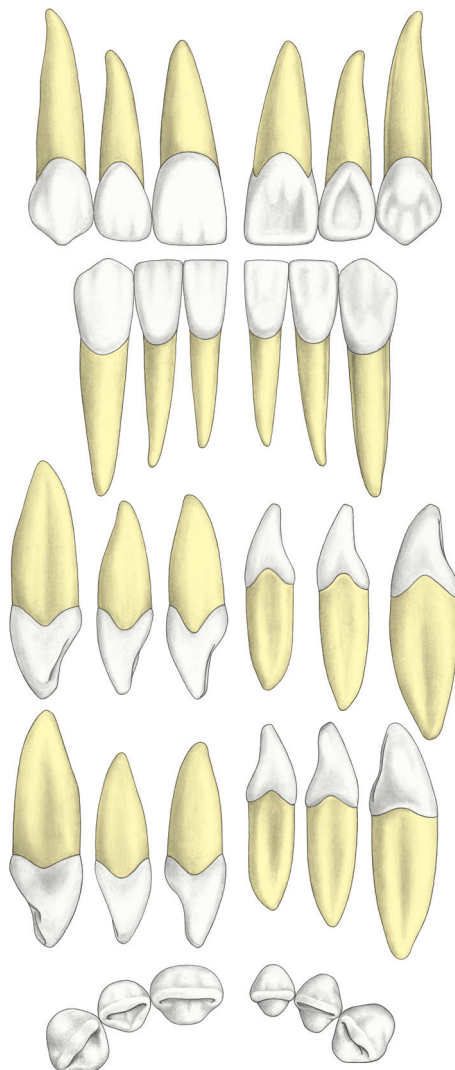
## Primary and Secondary Mandibular Molars



## Secondary Incisors

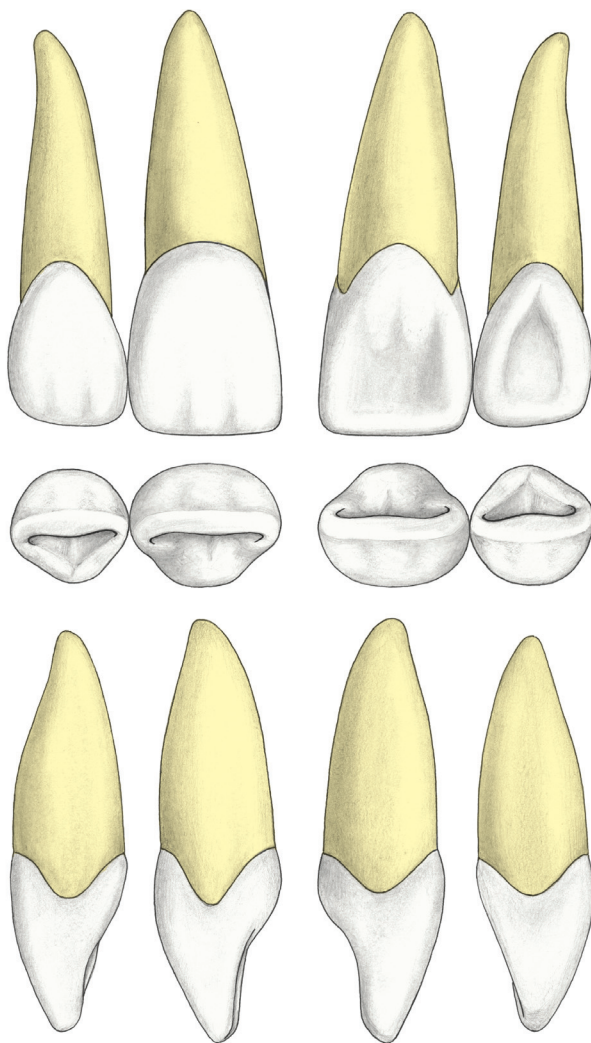


## Secondary Incisors and Canines

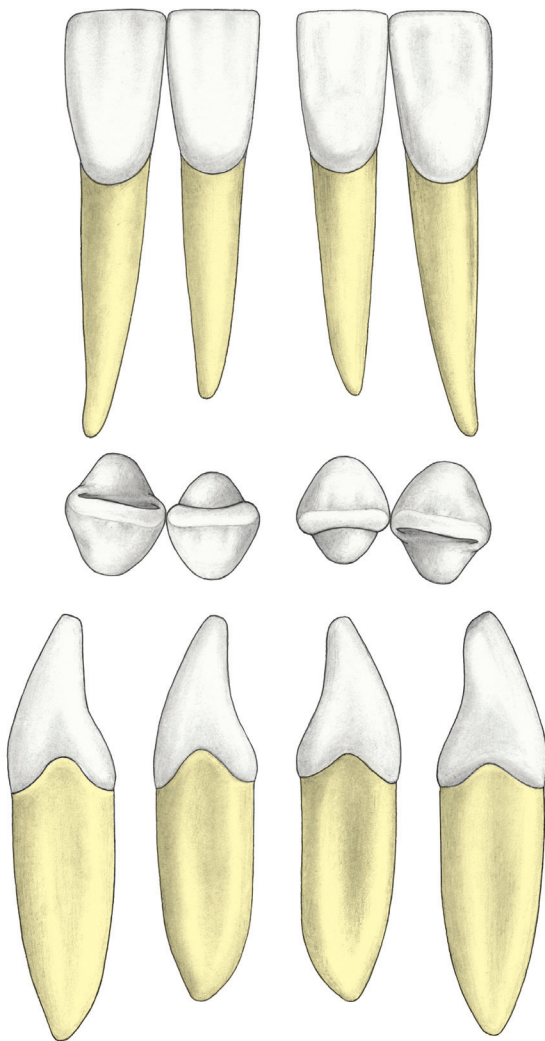




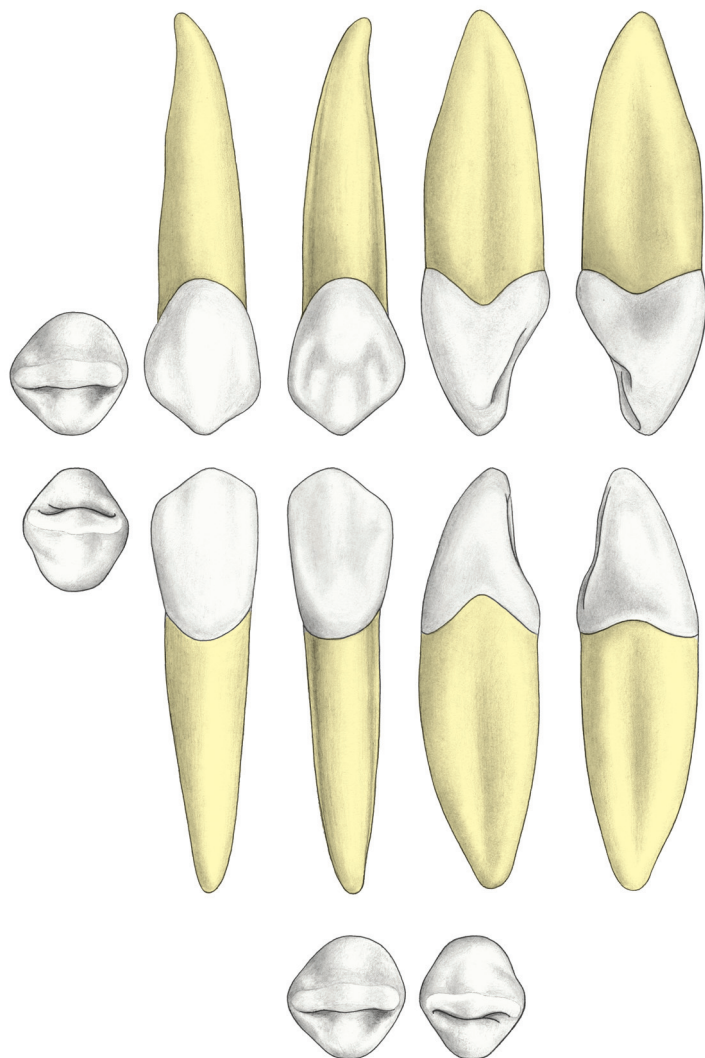
## Secondary Maxillary Central and Lateral Incisors



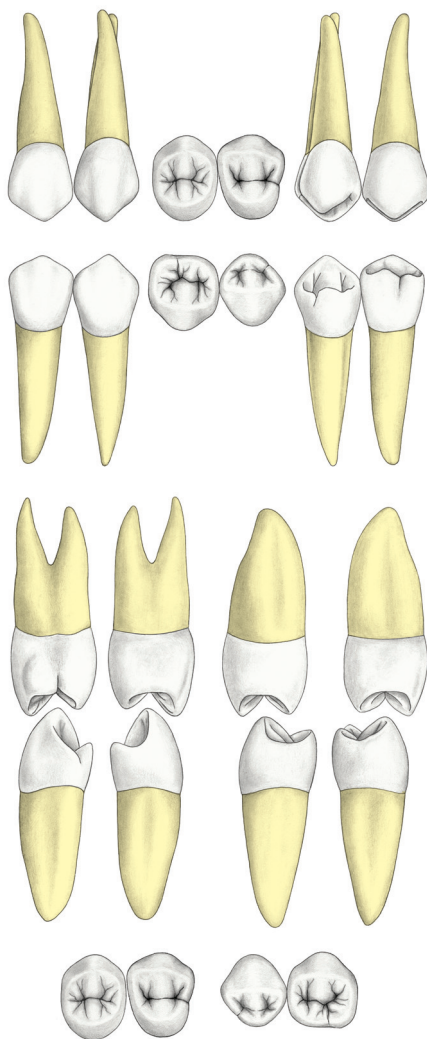
## Secondary Mandibular Central and Lateral Incisors



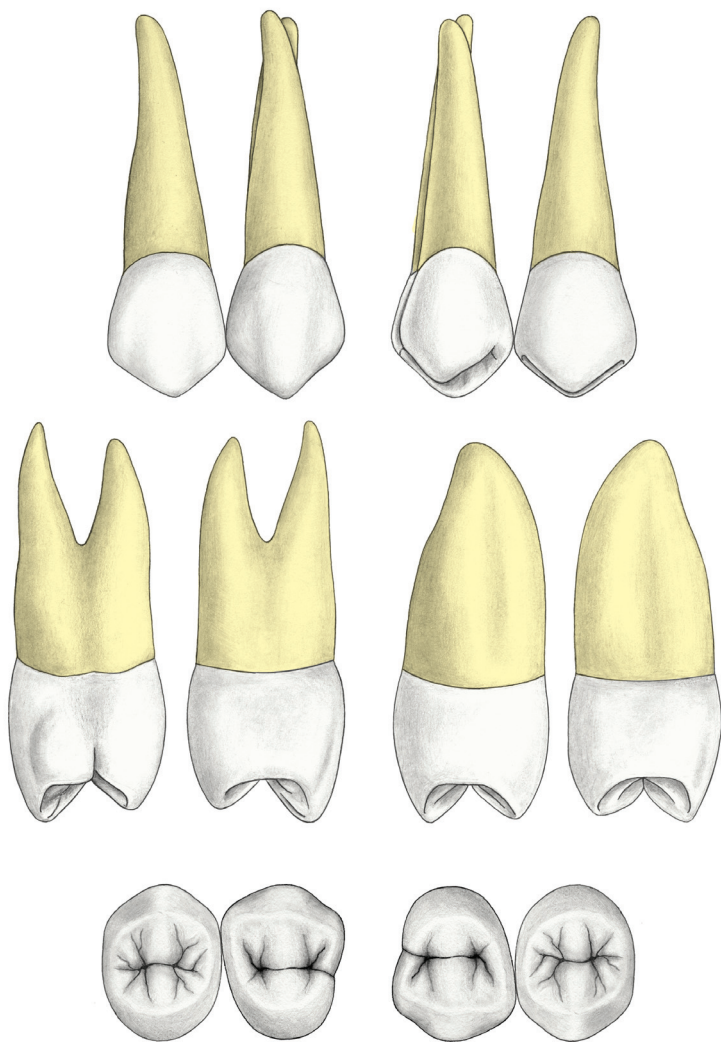
## Secondary Maxillary and Mandibular Canines



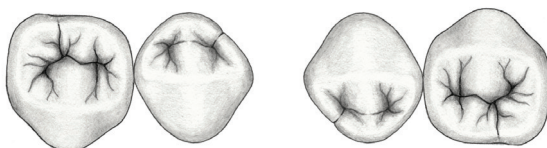
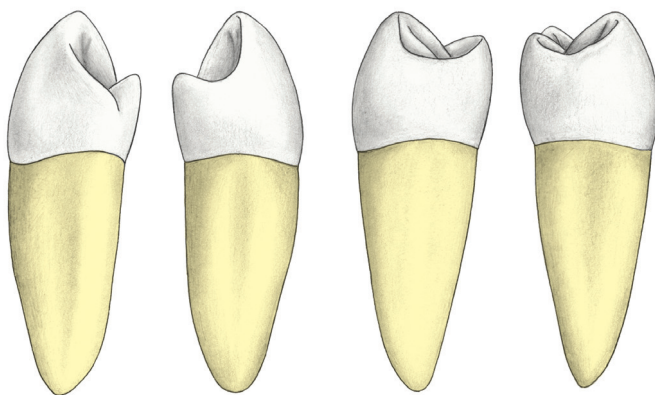
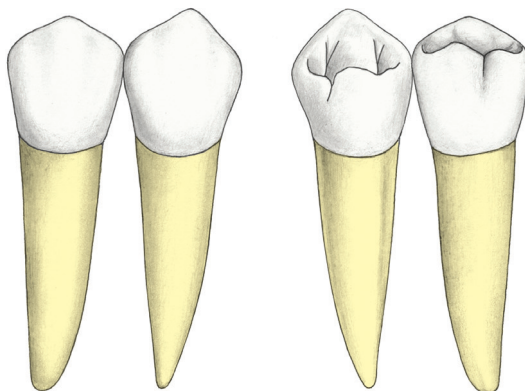
## Secondary Maxillary and Mandibular Premolars



## Secondary Maxillary First and Second Premolars

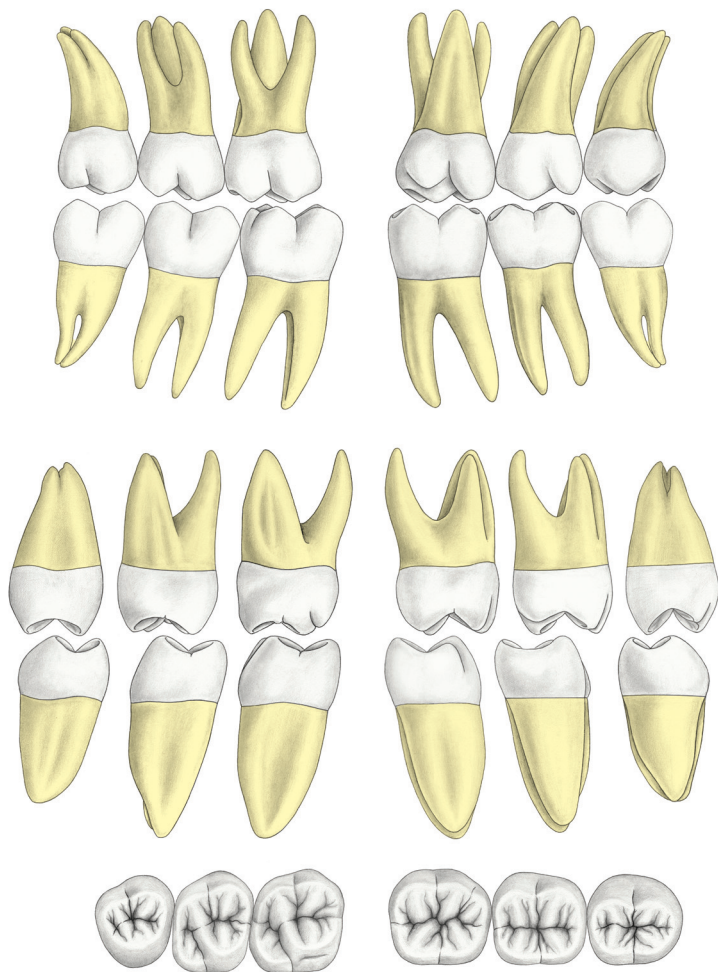


## **Secondary Mandibular First and Second Premolars**



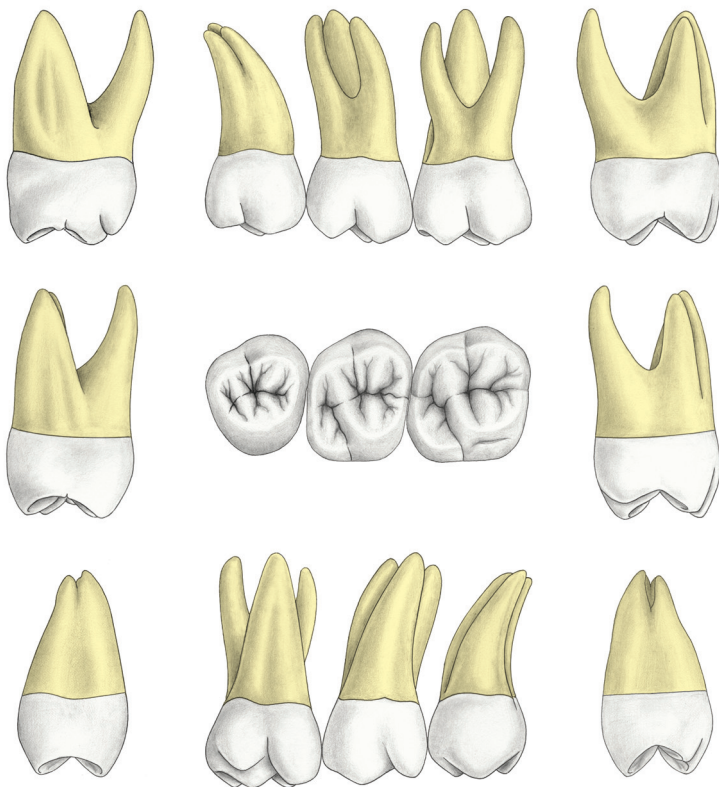
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## Secondary Maxillary and Mandibular Molars

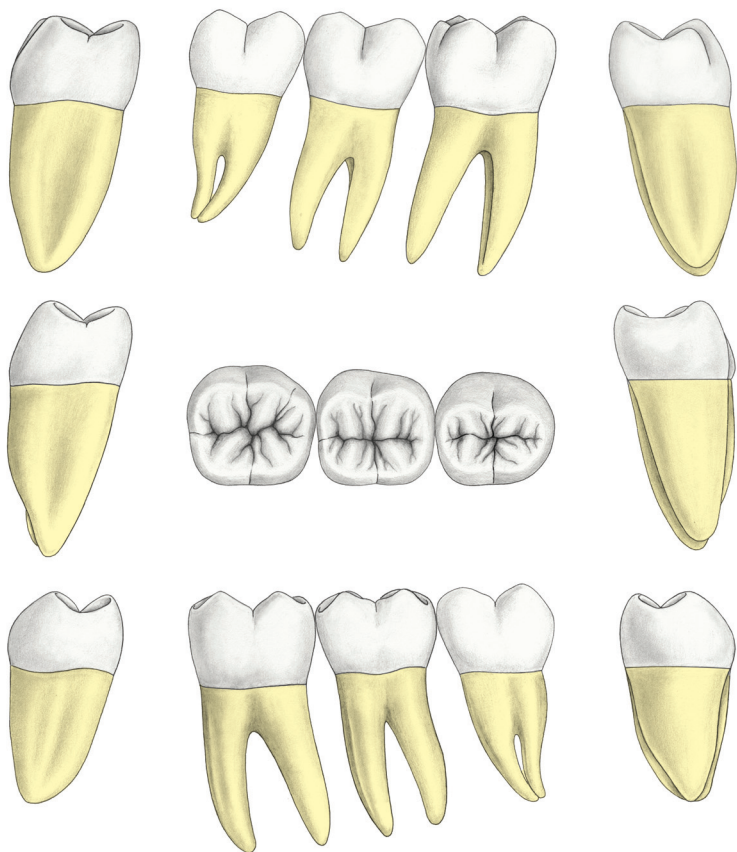




**Secondary Maxillary First,  
Second, and Third Molars**



## Secondary Mandibular First, Second, and Third Molars



## PRIMARY (DECIDUOUS) TOOTH DIMENSIONS - MAXILLA

Arch/Tooth/Dimension		Ash Wheeler	Black	Dewey	Jordan Abrams Kraus	Kramer Ireland	Linek	Woelfel Scheid	Mean Dimensions*
Central Incisor	MD	6.5	6.5	6.5	6.5	6.6	6.7	7.4	6.8
	IC	6.0	6.0	6.0	6.0	6.0	6.3	6.4	6.2
	FL	5.0	5.0	-	5.0	5.0	5.0	5.0	5.0
	RL	10.0	10.0	10.0	-	10.3	11.7	11.3	10.8
	MDC	4.5	4.5	-	-	4.6	4.9	5.7	4.9
	FLC	4.0	4.0	-	-	4.1	4.1	4.4	4.2
Lateral Incisor	MD	5.1	5.1	5.1	5.1	5.1	5.4	5.8	5.4
	IC	5.6	5.6	5.6	5.6	5.6	5.9	7.4	6.1
	FL	4.0	4.0	-	4.0	4.8	4.8	4.9	4.6
	RL	11.4	11.4	11.4	-	10.2	11.1	10.9	10.9
	MDC	3.7	3.7	-	-	3.7	4.0	4.0	3.9
	FLC	3.7	3.7	-	-	3.7	4.3	4.5	4.1
Canine	MD	7.0	7.0	7.0	7.0	6.8	6.7	7.4	7.0
	IC	6.5	6.5	6.5	6.5	6.0	6.5	7.6	6.7
	FL	7.0	7.0	-	7.0	6.9	6.0	5.4	6.3
	RL	13.5	13.5	13.5	-	12.8	11.5	13.5	12.8
	MDC	5.1	5.1	-	-	4.9	4.6	5.3	5.0
	FLC	5.5	5.5	-	-	5.4	5.2	5.0	5.3
First Molar	MD	7.3	7.3	7.3	7.3	7.0	7.6	8.1	7.5
	OC	5.1	5.1	5.1	5.1	5.8	6.0	6.0	5.7
	FL	8.5	8.5	-	8.5	8.6	8.8	9.5	8.9
	RL	10.0	10.0	10.0	-	MF 8.8 DF 8.2 L 7.8	9.0	12.5	MF 8.8** DF 8.2** L 7.8**
	MDC	5.2	5.2	-	-	4.9	5.6	5.9	5.4
	FLC	6.9	6.9	-	-	7.9	7.6	8.9	7.8
Second Molar	MD	8.2	8.2	8.2	8.2	9.1	8.9	9.7	9.0
	OC	5.7	5.7	5.7	5.7	6.4	6.4	6.4	6.2
	FL	10.0	10.0	-	10.0	10.0	9.9	10.3	10.1
	RL	11.7	11.7	11.7	-	MF 10.8 DF 9.7 L 10.8	11.1	10.4	MF 10.8** DF 9.7** L 10.8**
	MDC	6.4	6.4	-	-	6.3	6.2	7.1	6.5
	FLC	8.3	8.3	-	-	8.2	8.5	9.6	8.7

\*Mean dimensions are based upon 4 sources (Black; Kramer/Ireland; Linek; Woelfel/Scheid). The dimensions provided by Ash/Wheeler; Dewey; and Jordan/Abrams/Kraus are the same as Black and therefore the mean dimensions included only the values identified by Black since he was chronologically the first author to present the dimensions.

\*\*Based on the only author (Kramer/Ireland) who provided mean dimensions for all 3 roots (mesiofacial, distofacial, and lingual).

Dimensional abbreviations: MD=mesiodistal, IC=incisocervical, FL=faciolingual, RL=root length, MDC=mesiodistal at cervix, FLC=faciolingual at cervix.

## PRIMARY (DECIDUOUS) TOOTH DIMENSIONS - MANDIBLE

Arch/Tooth/Dimension	Ash Wheeler	Black	Dewey	Jordan Abrams Kraus	Kramer Ireland	Linek	Woelfel Scheid	Mean Dimensions*
<b>Central Incisor</b>	MD	4.2	4.2	4.2	4.3	4.3	4.5	4.3
	IC	5.0	5.0	5.0	4.9	5.8	6.1	5.5
	FL	4.0	4.0	-	4.0	3.9	4.5	4.2
	RL	9.0	9.0	9.0	-	8.9	10.5	9.2
	MDC	3.0	3.0	-	-	3.1	3.5	3.1
	FLC	3.5	3.5	-	-	3.6	4.2	3.7
<b>Lateral Incisor</b>	MD	4.1	4.1	4.1	4.1	4.9	4.9	4.5
	IC	5.2	5.2	5.2	5.2	6.5	7.3	6.1
	FL	4.0	4.0	-	4.0	4.4	4.8	4.3
	RL	10.0	10.0	10.0	-	9.9	10.6	10.0
	MDC	3.0	3.0	-	-	3.1	3.4	3.3
	FLC	3.5	3.5	-	-	3.6	4.2	4.0
<b>Canine</b>	MD	5.0	5.0	5.0	5.2	6.2	6.1	5.6
	IC	6.0	6.0	6.0	5.9	7.0	8.2	6.8
	FL	4.8	4.8	-	4.8	5.3	5.7	5.2
	RL	11.5	11.5	11.5	-	10.8	11.0	11.3
	MDC	3.7	3.7	-	-	3.8	4.6	4.1
	FLC	4.0	4.0	-	-	4.2	5.0	4.4
<b>First Molar</b>	MD	7.7	7.7	7.7	8.3	7.7	8.7	8.1
	OC	6.0	6.0	6.0	5.9	6.0	7.1	6.3
	FL	7.0	7.0	-	7.0	7.3	7.4	7.2
	RL	9.8	9.8	9.8	-	M 10.5 D 8.9	10.0	M 10.5*** D 8.9***
	MDC	6.5	6.5	-	-	6.3	7.2	6.6
	FLC	5.3	5.3	-	-	5.6	5.3	5.7
<b>Second Molar</b>	MD	9.9	9.9	9.9	9.9	9.5	10.3	9.9
	OC	5.5	5.5	5.5	5.5	6.0	6.6	5.9
	FL	8.7	8.7	-	8.7	8.7	9.2	8.9
	RL	11.3	11.3	11.3	-	M 11.4 D 10.5	10.8	M 11.4*** D 10.5***
	MDC	7.2	7.2	-	-	7.6	7.6	7.4
	FLC	6.4	6.4	-	-	6.8	7.1	6.7

\*Mean dimensions are based upon 4 sources (Black; Kramer/Ireland; Linek; Woelfel/Scheid). The dimensions provided by Ash/Wheeler; Dewey; and Jordan/Abrams/Kraus are the same as Black and therefore the mean dimensions included only the values identified by Black since he was chronologically the first author to present the dimensions.

\*\*\*Based on the only author (Kramer/Ireland) who provided mean dimensions for both roots (mesial and distal).

Dimensional abbreviations: MD=mesiodistal, IC=incisocervical, FL=faciolingual, RL=root length, MDC=mesiodistal at cervix, FLC=faciolingual at cervix.

## SECONDARY (PERMANENT) TOOTH DIMENSIONS - MAXILLA

Arch/Tooth/Dimension		Ash Wheeler	Bjorndal Hendersson Skidmore Kellner	Black	Dewey	Diamond	Jordan Abrams Kraus	Linek	Renner	Shillingburg Kaplan Grace	Woelfel Scheid	*Mean Dimen.
Central Incisor	MD	8.5	9.0	9.0	9.0	10.0	8.5	9.0	8.5	8.5	8.6	8.9
	IC/OC	10.5	11.2	10.0	10.0	12.0	10.5	11.3	10.5	10.4	11.2	10.9
	FL	7.0	7.4	7.0	7.0	8.0	7.0	7.8	7.0	7.1	7.1	7.3
	RL	13.0	12.5	12.5	12.0	**16.0	**13.0	**14.2	13.0	12.6	13.0	13.4
Lateral Incisor	MD	6.5	6.9	6.4	6.4	7.0	6.5	7.0	6.5	7.0	6.6	6.8
	IC/OC	9.0	9.9	8.8	8.8	10.0	9.0	10.1	9.0	9.9	9.8	9.6
	FL	6.0	6.6	6.0	6.0	7.0	6.0	6.7	6.0	6.6	6.2	6.4
	RL	13.0	13.0	13.0	13.0	**15.0	**13.0	**12.4	13.0	12.1	13.4	13.1
Canine	MD	7.5	7.7	7.6	7.6	9.0	7.5	8.4	7.5	7.4	7.6	7.9
	IC/OC	10.0	11.0	9.5	9.5	12.0	10.0	11.4	10.0	10.4	10.6	10.7
	FL	8.0	8.4	8.0	8.0	8.0	8.0	8.8	8.0	8.0	8.1	8.3
	RL	17.0	16.3	17.3	17.3	**20.0	**17.0	**17.6	17.0	15.3	16.5	17.1
First Premolar	MD	7.0	7.0	7.2	7.2	8.0	7.0	7.5	7.0	7.0	7.1	7.3
	IC/OC	8.5	9.1	8.2	8.2	9.0	8.5	9.3	8.5	8.1	8.6	8.7
	FL	9.0	9.5	9.1	9.1	10.0	9.0	9.7	9.0	9.2	9.2	9.4
	RL	14.0	F13.7 L13.7	12.4	12.4	**14.0	**15.0	**13.2	F14.0 L14.0	12.2	13.4	*F13.9 *L13.9
Second Premolar	MD	7.0	7.2	6.8	6.8	7.0	7.0	7.2	7.0	6.6	6.6	6.9
	IC/OC	8.5	8.5	7.5	7.5	8.0	8.5	8.8	8.5	7.8	7.7	8.1
	FL	9.0	9.4	8.8	8.8	9.0	9.0	9.5	9.0	8.8	9.0	9.1
	RL	14.0	14.4	14.0	14.0	**17.0	**14.0	**13.4	14.0	13.6	14.0	14.3
First Molar	MD	10.0	10.9	10.7	10.7	12.0	10.0	11.3	10.0	10.3	10.4	10.8
	IC/OC	7.5	8.4	7.7	7.7	9.0	7.5	8.0	7.5	7.8	7.5	8.0
	FL	11.0	11.8	11.8	11.8	12.0	11.0	11.8	11.0	11.4	11.5	11.6
	RL	F12 L13	MF12.9 DF13.1 L14.2	13.2	13.2	**16.0	**12.0	**13.5	F13.0 L12.0	13.3	MF12.9 DF12.2 L13.7	**MF12.9 **DF12.7 **L14.0
Second Molar	MD	9.0	10.2	9.2	9.2	10.0	9.0	10.0	9.0	9.8	9.8	9.7
	IC/OC	7.0	8.4	7.2	7.2	8.0	7.0	7.8	7.0	7.9	7.6	7.7
	FL	11.0	11.8	11.5	11.5	11.0	11.0	11.5	11.0	11.6	11.4	11.4
	RL	F11 L12	MF13.3 DF12.8 L13.8	13.0	13.0	**16.0	**11.0	**12.7	F11.0 L12.0	12.6	MF12.9 DF12.1 L13.5	**MF13.1 **DF12.5 **L13.7
Third Molar	MD	8.5	-	8.6	8.6	9.0	8.5	9.8	8.5	9.0	9.2	9.0
	IC/OC	6.5	-	6.3	6.3	7.0	6.5	7.5	6.5	7.2	7.2	7.0
	FL	10.0	-	10.6	10.6	10.0	10.0	11.2	10.0	10.8	11.1	10.6
	RL	11.0	-	11.4	11.4	**15.0	**11.0	**11.0	F10, L10	10.6	MF10.8 DF10.1 L11.2	**MF10.8 ***DF10.1 ***L11.2

\* Based on the dimensions of Ash/Wheeler; Bjorndal et al; Black; Diamond; Linek; Shillingburg/Kaplan/Grace; Woelfel/Scheid, Dewey provided the same dimensions

\*\* as Black. Jordan/Abrams/Kraus present the same dimensions as Ash/Wheeler except for maxillary molar root lengths. Renner is the same as Ash/Wheeler except for the molar root lengths.

\*\*\* Root length was not provided by the author but was calculated by subtracting the crown length from the overall tooth length which were provided by the author.

• Based on the two references (Bjorndal et al; Renner) that provide numbers for the length of both roots (facial and lingual).

• Based on the two references (Bjorndal et al; Woelfel/Scheid) that provide numbers for the length of all 3 roots (mesiofacial, distofacial, and lingual).

\*\*\* Based on the only reference (Woelfel/Scheid) that provided numbers for the length of all 3 roots (mesiofacial, distofacial, and lingual).

## SECONDARY (PERMANENT) TOOTH DIMENSIONS - MANDIBLE

Arch/Tooth/Dimension	Ash Wheeler	Bjorndal Henderson Skidmore Kellner	Black	Dewey	Diamond	Jordan Abrams Kraus	Linek	Renner	Shillingburg Kaplan Grace	Woelfel Scheid	*Mean Dimen.
<b>Central Incisor</b>	MD	5.7	5.4	5.4	6.0	5.0	6.0	5.0	5.5	5.3	5.6
	IC/OC	9.7	8.8	8.8	9.0	9.0	10.0	9.0	9.0	8.8	9.2
	FL	5.9	6.0	6.0	6.0	6.0	6.3	6.0	6.2	5.7	6.0
	RL	12.5	11.8	11.8	**15.0	**12.5	12.0**	12.5	13.0	12.6	12.8
<b>Lateral Incisor</b>	MD	5.5	5.9	5.9	6.5	5.5	6.5	5.5	6.0	5.7	6.0
	IC/OC	9.5	9.6	9.6	10.0	9.5	10.6	9.5	9.4	9.4	9.8
	FL	6.5	6.4	6.4	6.5	6.5	6.7	6.5	6.3	6.1	6.4
	RL	14.0	12.7	12.7	**16.0	**14.0	**13.4	14.0	12.3	13.5	13.6
<b>Canine</b>	MD	7.0	6.9	6.9	8.0	7.0	7.3	7.0	6.7	6.8	7.1
	IC/OC	11.0	10.3	10.3	12.0	11.0	11.5	11.0	10.4	11.0	11.1
	FL	7.5	7.9	7.9	9.0	7.5	8.3	7.5	7.4	7.7	7.9
	RL	16.0	15.3	15.3	**20.0	**15.0	**17.5	16.0	14.6	15.9	16.4
<b>First Premolar</b>	MD	7.0	6.9	6.9	7.5	7.0	7.8	7.0	6.9	7.0	7.2
	IC/OC	8.5	7.8	7.8	9.0	8.5	9.5	8.5	8.5	8.8	8.7
	FL	7.5	7.7	7.7	9.0	7.5	8.5	8.0	7.6	7.7	8.0
	RL	14.0	14.0	14.0	**16.0	**14.0	**14.5	14.0	13.9	14.4	14.5
<b>Second Premolar</b>	MD	7.0	7.1	7.1	8.0	7.0	7.8	7.0	7.2	7.1	7.4
	IC/OC	8.0	7.9	7.9	9.0	8.0	9.0	8.0	8.6	8.2	8.5
	FL	8.0	8.0	8.0	10.0	8.0	9.0	8.0	8.0	8.2	8.5
	RL	14.5	14.4	14.4	**16.0	**14.5	**15.0	14.5	14.0	14.7	14.7
<b>First Molar</b>	MD	11.0	11.2	11.2	12.0	11.0	11.9	11.0	11.6	11.4	11.6
	IC/OC	7.5	7.7	7.7	9.0	7.5	8.2	7.5	8.3	7.7	8.1
	FL	10.5	10.3	10.3	11.0	10.5	10.8	10.5	10.4	10.2	10.6
	RL	14.0	M15.1 D13.6	13.2	**15.0	**14.0	**13.8	M14 D14	12.4	M14.0 D13.0	+M14.4 +D13.5
<b>Second Molar</b>	MD	10.5	10.7	10.7	11.0	10.5	11.0	10.5	11.4	10.8	11.0
	IC/OC	7.0	6.9	6.9	8.0	7.0	8.0	7.0	8.5	7.7	7.8
	FL	10.0	10.1	10.1	10.0	10.0	10.3	10.5	10.2	9.9	10.1
	RL	13.0	M13.8 D13.4	12.9	**14.0	**13.0	**13.0	M13 D12.5	12.3	M13.9 D13.0	+M13.6 +D13.0
<b>Third Molar</b>	MD	10.0	-	10.7	10.0	10.0	10.7	10.0	11.3	11.3	10.7
	IC/OC	7.0	-	6.7	7.0	7.0	7.5	7.0	7.7	7.5	7.2
	FL	9.5	-	9.8	9.8	9.5	10.0	9.5	10.0	10.1	9.9
	RL	11.0	-	11.8	**13.0	**11.0	**11.5	M11 D10.5	9.8	M11.8 D10.8	++M11.4 ++D10.7

\* Based on the dimensions of Ash/Wheeler; Bjorndal et al; Black; Diamond; Linek; Shillingburg/Kaplan/Grace; Woelfel/Scheid, Dewey provided the same dimensions as Black. Jordan/Abrams/Kraus present the same dimensions as Ash/Wheeler except for maxillary molar root lengths. Renner is the same as Ash/Wheeler except for the maxillary root lengths.

\*\* Root length was not provided by the author but was calculated by subtracting the crown length from the overall tooth length which were provided by the author.

+ Based on the three references (Bjorndal et al; Renner; Woelfel/Scheid) that provide numbers for the length of both roots (mesial and distal).

++ Based on the two references (Renner; Woelfel/Scheid) that provide numbers for the length of both roots (mesial and distal).

Dimensional abbreviations: MD=mesiodistal, IC/OC=incisocervical/occlusocervical, FL=faciolinguall, RL=root length

SECONDARY (PERMANENT) TOOTH DIMENSIONS AT THE CERVICAL LINE

Arch/Tooth/Dimension	Ash/Wheeler		Black		Dewey		Diamond		Woelfel/Scheid		Mean	
MAXILLARY	MD	FL	MD	FL	MD	FL	MD	FL	MD	FL	MD*	FL**
Central Incisor	7.0	6.0	6.3	-	6.3	-	7.0	7.0	6.4	6.3	6.6	6.4
Lateral Incisor	5.0	5.0	4.4	-	4.4	-	5.0	6.0	4.7	5.8	4.7	5.6
Canine	5.5	7.0	5.2	-	5.2	-	6.0	8.0	5.6	7.6	5.5	7.5
First Premolar	5.0	8.0	4.9	-	4.9	-	6.0	9.0	4.8	8.2	5.1	8.4
Second Premolar	5.0	8.0	5.3	-	5.3	-	6.0	8.0	4.7	8.1	5.3	8.0
First Molar	8.0	10.0	7.5	-	7.5	-	10.0	11.0	7.9	10.7	8.2	10.6
Second Molar	7.0	10.0	6.7	-	6.7	-	8.0	10.0	7.6	10.7	7.2	10.2
Third Molar	6.5	9.5	6.1	-	6.1	-	7.0	9.0	7.2	10.4	6.6	9.6

MD = Mesiodistal

FL = Faciolingual

\* Based on measurements provided by the following 5 authors: Ash/Wheeler; Black; Dewey; Diamond; Woelfel/Scheid.

\*\* Based on measurements provided by the following 3 authors: Ash/Wheeler; Diamond; Woelfel/Scheid.

# SECONDARY (PERMANENT) TOOTH DIMENSIONS AT THE CERVICAL LINE

Arch/Tooth/Dimension	Ash/Wheeler		Black		Dewey		Diamond		Woelfel/Scheid		Mean	
MANDIBULAR	MD	FL	MD	FL	MD	FL	MD	FL	MD	FL	MD*	FL**
Central Incisor	3.5	5.3	3.5	-	3.5	-	4.0	5.5	3.5	5.4	3.6	5.4
Lateral Incisor	4.0	5.8	3.8	-	3.8	-	5.0	6.0	3.8	5.8	4.0	5.9
Canine	5.5	7.0	5.2	-	5.2	-	6.0	8.0	5.2	7.5	5.4	7.5
First Premolar	5.0	6.5	4.7	-	4.7	-	5.5	8.0	4.8	7.0	5.3	7.2
Second Premolar	5.0	7.0	4.8	-	4.8	-	6.0	9.0	5.0	7.3	4.9	7.5
First Molar	9.0	9.0	8.5	-	8.5	-	10.0	10.0	9.2	9.0	9.0	9.3
Second Molar	8.0	9.0	8.1	-	8.1	-	9.0	9.0	9.1	8.8	8.5	8.9
Third Molar	7.5	9.0	8.3	-	8.3	-	8.0	9.0	9.2	8.9	8.3	9.0

MD = Mesiodistal

FL = Faciolingual

\* Based on measurements provided by the following 5 authors: Ash/Wheeler; Black; Dewey; Diamond; Woelfel/Scheid.

\*\* Based on measurements provided by the following 3 authors: Ash/Wheeler; Diamond; Woelfel/Scheid.



## CORONAL OUTLINE FORM

Arch/Tooth	Facial View	Proximal View	Incisal/Occlusal View
<b>Maxillary Central Incisor</b>	<ul style="list-style-type: none"> <li>• Square or rectangular (AW)</li> <li>• Imperfect square with rounded gingival side (B)</li> <li>• Trapezoidal (FDS)</li> <li>• Square, tapering, or ovoid (R)</li> </ul>	<ul style="list-style-type: none"> <li>• Wedge shaped (AW)(WS)</li> <li>• Triangular (FDS)(R)</li> <li>• V-shaped (B)</li> <li>• Chisel shaped (JAK)</li> </ul>	<ul style="list-style-type: none"> <li>• Triangular (AW)(FDS)(JAK)(R)</li> </ul>
<b>Maxillary Lateral Incisor</b>	<ul style="list-style-type: none"> <li>• Trapezoidal (FDS)</li> <li>• Rounded (R)</li> </ul>	<ul style="list-style-type: none"> <li>• Wedge shaped (AW)(WS)</li> <li>• Triangular (FDS)(R)</li> <li>• V-shaped (B)</li> <li>• Chisel shaped (JAK)</li> </ul>	<ul style="list-style-type: none"> <li>• Triangular (AW)(FDS)(JAK)(R)</li> </ul>
<b>Maxillary Canine</b>	<ul style="list-style-type: none"> <li>• Trapezoidal (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Wedge shaped (AW)(JAK)(WS)</li> <li>• Triangular (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Asymmetrical diamond shape (FDS)</li> </ul>
<b>Maxillary First Premolar</b>	<ul style="list-style-type: none"> <li>• Trapezoidal (AW)(FDS)</li> <li>• Ovoid in occlusal half (R)</li> <li>• Pentagonal (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Trapezoidal (AW)(FDS)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Hexagonal (AW)(FDS)(JAK)(R)</li> <li>• Inverted V-shape facially (WS)</li> </ul>
<b>Maxillary Second Premolar</b>	<ul style="list-style-type: none"> <li>• Trapezoidal (FDS)</li> <li>• Less ovoid than first premolar (R)</li> <li>• Pentagonal (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Trapezoidal (FDS)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Rounded (AW)(FDS), oval (AW)(WS), or oblong (WS)</li> <li>• Ovoid (JAK)(R)</li> </ul>
<b>Maxillary First Molar</b>	<ul style="list-style-type: none"> <li>• Trapezoidal (AW)(FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Trapezoidal (FDS)</li> <li>• Parallelogram (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Rhomboidal (AW)(B)(FDS)(R)</li> <li>• Parallelogram (WS)</li> </ul>
<b>Maxillary Second Molar</b>	<ul style="list-style-type: none"> <li>• Trapezoidal (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Trapezoidal (FDS)</li> <li>• Parallelogram (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Rhomboidal (AW)(FDS)(R)</li> <li>• Some are heart shaped (FDS)</li> <li>• Some are triangular or heart shaped (WS)</li> </ul>
<b>Maxillary Third Molar</b>	<ul style="list-style-type: none"> <li>• Trapezoidal (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Trapezoidal (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Heart shaped most commonly (AW)(FDS)</li> <li>• Heart shaped or triangular (R)</li> </ul>

### Author Abbreviations

AW= Ash/Wheeler

B=Black

FDS= Fuller/Denehy/Schulcin

JAK= Jordan/Abrams/Kraus

R=Renner

WS=Woelfel/Scheid

## CORONAL OUTLINE FORM

Arch/Tooth	Facial View	Proximal View	Incisal/Occlusal View
<b>Mandibular Central Incisor</b>	<ul style="list-style-type: none"> <li>Trapezoidal (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Wedge shaped (JAK)(WS)</li> <li>Triangular (FDS)</li> <li>Chisel shaped (R)</li> </ul>	<ul style="list-style-type: none"> <li>4-sided or diamond shaped (FDS)</li> <li>Triangular (R)</li> </ul>
<b>Mandibular Lateral Incisor</b>	<ul style="list-style-type: none"> <li>Trapezoidal (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Wedge shaped (JAK)(WS)</li> <li>Triangular (FDS)</li> <li>Chisel shaped (R)</li> </ul>	<ul style="list-style-type: none"> <li>4-sided or diamond shaped (FDS)</li> <li>Triangular (R)</li> </ul>
<b>Mandibular Canine</b>	<ul style="list-style-type: none"> <li>Trapezoidal (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Wedge shaped (AW)(JAK)(R)(WS)</li> <li>Triangular (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Asymmetrical diamond shaped (FDS)</li> </ul>
<b>Mandibular First Premolar</b>	<ul style="list-style-type: none"> <li>Trapezoidal (FDS)</li> <li>Pentagonal (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Rhomboidal (AW)(FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Diamond shaped (AW)(JAK)(R)(WS)</li> <li>Rhomboidal or diamond shaped (FDS)</li> </ul>
<b>Mandibular Second Premolar</b>	<ul style="list-style-type: none"> <li>Trapezoidal (FDS)</li> <li>Pentagonal (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Rhomboidal (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>3-cusp form - nearly square (AW)(WS)</li> <li>2-cusp form - rounded or oval (AW)(WS)</li> <li>Nearly square (FDS)</li> <li>More or less square (JAK)</li> <li>Square (R)</li> </ul>
<b>Mandibular First Molar</b>	<ul style="list-style-type: none"> <li>Trapezoidal (AW)(B)(R)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>Rhomboidal (AW)(FDS)(R)</li> </ul>	<ul style="list-style-type: none"> <li>Pentagonal (FDS)(R)(WS)</li> <li>Hexagonal (AW)</li> <li>Trapezoidal (B)</li> </ul>
<b>Mandibular Second Molar</b>	<ul style="list-style-type: none"> <li>Trapezoidal (AW)(FDS)(R)</li> </ul>	<ul style="list-style-type: none"> <li>Rhomboidal (FDS)(R)</li> </ul>	<ul style="list-style-type: none"> <li>Rectangular (FDS)(R)(WS)</li> <li>Many are rectangular (AW)</li> <li>Parallelogram (B)</li> </ul>
<b>Mandibular Third Molar</b>	<ul style="list-style-type: none"> <li>Trapezoidal (AW)(FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Rhomboidal (FDS)</li> <li>Bulbous (R)</li> </ul>	<ul style="list-style-type: none"> <li>Rounded (AW)</li> <li>Rectangular or pentagonal (FDS)</li> <li>Ovoid (R)</li> <li>Rectangular or oval (WS)</li> </ul>

### Author Abbreviations

AW= Ash/Wheeler

B=Black

FDS= Fuller/Denehy/Schulein

JAK= Jordan/Abrams/Kraus

R=Renner

WS=Woelfel/Scheid

## CORONAL HEIGHTS OF CONTOUR

Arch/Tooth	Facial Surface	Lingual Surface
Maxillary Central Incisor	<ul style="list-style-type: none"> <li>In the cervical 1/3 (FDS)(JAK)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>In the cervical 1/3, at prominence of cingulum (FDS)</li> <li>In the cervical 1/3 on cingulum (WS)</li> </ul>
Maxillary Lateral Incisor	<ul style="list-style-type: none"> <li>In the cervical 1/3 (FDS)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>In the cervical 1/3, at prominence of cingulum (FDS)</li> <li>In the cervical 1/3 on cingulum (WS)</li> </ul>
Maxillary Canine	<ul style="list-style-type: none"> <li>In the cervical 1/3 (FDS)(WS)</li> <li>At the junction of the cervical and middle thirds (AW)</li> </ul>	<ul style="list-style-type: none"> <li>At the junction of the cervical and middle thirds (AW)</li> <li>In the cervical 1/3, at prominence of cingulum (FDS)</li> <li>In the cervical 1/3 on cingulum (WS)</li> </ul>
Maxillary First Premolar	<ul style="list-style-type: none"> <li>In the cervical 1/3 (FDS)(JAK)(WS)</li> <li>At the junction of the cervical and middle third (AW)</li> </ul>	<ul style="list-style-type: none"> <li>Halfway between the cusp tip and cervical line (AW)(JAK)</li> <li>In the middle 1/3 (FDS)(WS)</li> </ul>
Maxillary Second Premolar	<ul style="list-style-type: none"> <li>In the cervical 1/3 (JAK)(WS)</li> <li>Similar to first premolar (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Similar to first premolar (FDS)</li> <li>Halfway between the cusp tip and cervical line</li> <li>In the middle 1/3 (WS)</li> </ul>
Maxillary First Molar	<ul style="list-style-type: none"> <li>In the cervical 1/3 (AW)(FDS)(JAK)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>In the middle 1/3 (FDS)(WS)</li> <li>Near the middle 1/3 (AW)</li> <li>Halfway between the cusp tip and cervical line (JAK) middle 1/3 (WS)</li> </ul>
Maxillary Second Molar	<ul style="list-style-type: none"> <li>In the cervical 1/3 (WS)</li> </ul>	<ul style="list-style-type: none"> <li>In the middle 1/3 (WS)</li> </ul>
Maxillary Third Molar	<ul style="list-style-type: none"> <li>In the cervical 1/3 (WS)</li> </ul>	<ul style="list-style-type: none"> <li>In the middle 1/3 (WS)</li> </ul>

### Author Abbreviations

AW= Ash/Wheeler

FDS= Fuller/Denehy/Schulcin

JAK= Jordan/Abrams/Kraus

WS= Woelfel/Scheid

## CORONAL HEIGHTS OF CONTOUR

Arch/Tooth	Facial Surface	Lingual Surface
<b>Mandibular Central Incisor</b>	<ul style="list-style-type: none"> <li>• In the cervical 1/3 (FDS)</li> <li>• In the cervical 1/3, just incisal to the cervical line (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• In cervical 1/3, at prominence of cingulum (FDS)</li> <li>• In the cervical 1/3, just incisal to the cervical line (WS)</li> </ul>
<b>Mandibular Lateral Incisor</b>	<ul style="list-style-type: none"> <li>• Closely resembles central incisor (FDS)</li> <li>• In the cervical 1/3, just incisal to the cervical line (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Closely resembles central incisor (FDS)</li> <li>• In the cervical 1/3, just incisal to CEJ (WS)</li> </ul>
<b>Mandibular Canine</b>	<ul style="list-style-type: none"> <li>• In the cervical 1/3 (FDS)</li> <li>• Just incisal to the cervical line (JAK)</li> <li>• In the cervical 1/3, closer to the cervical line than on the maxillary canine (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• In the cervical 1/3, at prominence of cingulum (WS)</li> <li>• In the cervical 1/3 on the cingulum (WS)</li> </ul>
<b>Mandibular First Premolar</b>	<ul style="list-style-type: none"> <li>• In the cervical 1/3 (FDS)(JAK)</li> <li>• In the cervical 1/3, near the middle 1/3 (AW)</li> <li>• In the cervical 1/3, just occlusal to the cervical line (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• In the middle 1/3 of overall occlusocervical crown dimension (FDS)(WS)</li> <li>• Two-thirds of the distance between the cervical line and lingual cusp tip (AW)</li> <li>• Near the occlusal 1/3 of the lingual surface (JAK)</li> </ul>
<b>Mandibular Second Premolar</b>	<ul style="list-style-type: none"> <li>• In the cervical 1/3 (JAK)</li> <li>• In the cervical 1/3, near the middle 1/3 (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• In the occlusal 1/3 of the lingual surface (FDS)(JAK)</li> <li>• In the middle 1/3 of the overall occlusocervical crown dimension (WS)</li> </ul>
<b>Mandibular First Molar</b>	<ul style="list-style-type: none"> <li>• In the cervical 1/3 (AW)(FDS)(JAK)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>• In the middle 1/3 (FDS)(WS)</li> <li>• Halfway between the lingual cusp tip and cervical line (AW)</li> </ul>
<b>Mandibular Second Molar</b>	<ul style="list-style-type: none"> <li>• In the cervical 1/3 (FDS)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>• In the middle 1/3 (FDS)(WS)</li> </ul>
<b>Mandibular Third Molar</b>	<ul style="list-style-type: none"> <li>• Can be bulbous and in the middle 1/3 (JAK)</li> <li>• In the cervical 1/3 (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Can be bulbous and in the middle 1/3 (JAK)</li> <li>• In the middle 1/3 (WS)</li> </ul>

### Author Abbreviations

AW= Ash/Wheeler

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WS= Woelfel/Scheid

## MARGINAL RIDGES ON POSTERIOR TEETH

Arch/Tooth	Highest Occlusal Height	Ridge Groove Present		Ridge Tubercles Present	
		Mesial	Distal	Mesial	Distal
<b>Maxillary First Premolar</b>	• Mesial higher than distal (FDS)(JAK)(WS)	• Yes (AW)(De)(Di)(JAK) • Yes, 97% of the time (WS)	• Yes (De)(Di) • Yes, 39% of the time (WS) • No (AW)(JAK)		
<b>Maxillary Second Premolar</b>	• Mesial higher than distal (FDS)(JAK)(WS)	• Usually absent (FDS) • No (AW)(JAK) • Yes, 37% of the time (WS)	• No (JAK) • Yes, 30% of the time (WS)		
<b>Maxillary First Molar</b>	• Mesial higher than distal (AW)(JAK)(WS)	• Yes (De)(Di)(FDS)(JAK) • Occasionally (AW) • Yes, 78% of the time (WS)	• Yes (De)(DI)(FDS) • Yes, 50% of the time (WS)	• Yes, numerous pronounced tubercles present (JAK) • Distinct tubercles present (R) • Present 86% of the time (WS) • More common on mesial (WS)	• Rarely present (JAK) • Present 18% of the time (WS)
<b>Maxillary Second Molar</b>	• Mesial higher than distal (WS)	• Yes, 67% of the time (WS)	• Yes, 38% of the time (WS)	• Less frequent and less prominent (WS) • Present 38% of the time (WS)	• Present 9% of the time (WS)
<b>Maxillary Third Molar</b>	• Mesial higher than distal (WS)	• Not described	• Not described	• No tubercles present (JAK)	

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## MARGINAL RIDGES ON POSTERIOR TEETH

Arch/Tooth	Highest Occlusal Height	Ridge Groove Present		Ridge Tubercles Present	
		Mesial	Distal	Mesial	Distal
<b>Mandibular First Premolar</b>	<ul style="list-style-type: none"> <li>• Distal higher than mesial (AW)(FDS)(JAK)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Yes (AW)(De)(FDS)(JAK)</li> <li>• Yes, 67% of the time (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Yes (De)(FDS)</li> <li>• No (AW)</li> <li>• As a variation (JAK)</li> <li>• Seldom, 8% of the time (WS)</li> </ul>		
<b>Mandibular Second Premolar</b>	<ul style="list-style-type: none"> <li>• Mesial higher than distal (AW)(FDS)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>• No (AW)(De)(JAK)</li> <li>• Not frequent, 21% of the time (WS)</li> <li>• Normally present (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• No (De)</li> <li>• Rarely present, 8% of the time (WS)</li> </ul>		
<b>Mandibular First Molar</b>	<ul style="list-style-type: none"> <li>• Mesial higher than distal (AW)(FDS)(JAK)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Sometimes present (AW)</li> <li>• Usually present (FDS)</li> <li>• Yes (JAK)</li> <li>• Yes, 68% of the time (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Yes (Di)(FDS)(JAK)</li> <li>• Often present (AW)</li> <li>• Yes, 48% of the time (WS)</li> </ul>		
<b>Mandibular Second Molar</b>	<ul style="list-style-type: none"> <li>• Mesial higher than distal (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Yes (De)</li> <li>• Yes, 57% of the time (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• No (JAK)</li> <li>• Yes, 35% of the time (WS)</li> </ul>		
<b>Mandibular Third Molar</b>	<ul style="list-style-type: none"> <li>• Mesial higher than distal (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Not described</li> </ul>	<ul style="list-style-type: none"> <li>• Not described</li> </ul>		

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## ROOT SURFACE FORM OF INCISORS, CANINES, AND PREMOLARS

Arch/Tooth	Mesial Surface	Distal Surface
<b>Maxillary Central Incisor</b>	<ul style="list-style-type: none"> <li>• Slightly grooved (Di)</li> <li>• Rounded form (FDS)</li> <li>• Flat or Depression present (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Slightly grooved (Di)</li> <li>• Rounded Form (FDS)</li> <li>• Convex form (WS)</li> </ul>
<b>Maxillary Lateral Incisor</b>	<ul style="list-style-type: none"> <li>• Same as central incisor (De)</li> <li>• Ovoid form (FDS)</li> <li>• Flat or Depression present (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Not uncommon to find Depression (AW)</li> <li>• Same as central incisor (De)</li> <li>• Ovoid Form (FDS)</li> <li>• Convex form (WS)</li> </ul>
<b>Maxillary Canine</b>	<ul style="list-style-type: none"> <li>• Shallow Depression (AW)</li> <li>• May be grooved (De)</li> <li>• Slightly convex or flat (FDS)</li> <li>• Slight Depression (JAK)</li> <li>• May have concavity (R)</li> <li>• Depression present 70% of the time (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Depression present, Deeper than mesial (AW)(JAK)(R)</li> <li>• Slightly convex or flat (FDS)</li> <li>• Depression present 90% of the time (WS)</li> <li>• May be grooved (De)</li> </ul>
<b>Maxillary First Premolar</b>	<ul style="list-style-type: none"> <li>• Depression present (AW)(FDS) (R)</li> <li>• Flattened (De)</li> <li>• Deep groove, deeper than distal (JAK)</li> <li>• Depression present 100% of the time, deeper than the distal (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Depression present, shallower than mesial (FDS)(JAK)(R)</li> <li>• No groove leading to furcation (AW)</li> <li>• Flattened (De)</li> <li>• Depression present 100% of the time but convex or flat near cervix (WS)</li> </ul>
<b>Maxillary Second Premolar</b>	<ul style="list-style-type: none"> <li>• Shallow groove present (AW)</li> <li>• May be grooved (De)</li> <li>• Convex or flat (FDS)</li> <li>• Similar to first premolar (FDS)</li> <li>• Depression present 78% of the time (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• May be grooved (De)</li> <li>• Convex or flat (FDS)</li> <li>• Depression present (JAK)</li> <li>• Depression present, deeper than mesial (WS)</li> </ul>

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## ROOT SURFACE FORM OF INCISORS, CANINES, AND PREMOLARS

Arch/Tooth	Mesial Surface	Distal Surface
<b>Mandibular Central Incisor</b>	<ul style="list-style-type: none"> <li>• Depression usually present (FDS)(WS)</li> <li>• Most have depression (AW)</li> <li>• Tendency for groove (De)</li> <li>• Shallow depression present (JAK)</li> </ul>	<ul style="list-style-type: none"> <li>• Depression usually present, deeper than mesial (AW)(WS)</li> <li>• Depression usually present (FDS)(JAK)</li> <li>• Tendency for groove (De)</li> </ul>
<b>Mandibular Lateral Incisor</b>	<ul style="list-style-type: none"> <li>• Depression usually present (AW)(FDS)(JAK)(WS)</li> <li>• Flattened or grooved (De)</li> </ul>	<ul style="list-style-type: none"> <li>• Depression usually present (AW)(JAK)</li> <li>• Depression present, deeper than mesial (FDS)(WS)</li> <li>• Flattened or grooved (De)</li> </ul>
<b>Mandibular Canine</b>	<ul style="list-style-type: none"> <li>• Depression present, more pronounced than maxillary canine (AW)</li> <li>• Flat or grooved (De)</li> <li>• Flat or concave (FDS)</li> <li>• Grooved surface (R)</li> <li>• Depression present 88% of the time (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Depression present (AW)</li> <li>• Flat or grooved (De)</li> <li>• Flat or concave (FDS)</li> <li>• Grooved surface (R)</li> <li>• Depression present 97% of the time, deeper than mesial (WS)</li> </ul>
<b>Mandibular First Premolar</b>	<ul style="list-style-type: none"> <li>• Depression present, often deep (AW)</li> <li>• Flattened (De)</li> <li>• Has Depression only occasionally (FDS)</li> <li>• May have deep depression (JAK)</li> <li>• Depression present 45% of the time (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Shallow depression present (AW)</li> <li>• Flattened (De)</li> <li>• Depression only occasionally present (FDS)</li> <li>• Depression present 86% of the time, deeper than mesial (WS)</li> </ul>
<b>Mandibular Second Premolar</b>	<ul style="list-style-type: none"> <li>• Most are slightly convex (AW)</li> <li>• Flat or grooved (De)</li> <li>• Similar to first premolar (FDS)</li> <li>• No depression 81% of the time (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Flat or grooved (De)</li> <li>• Similar to first premolar (FDS)</li> <li>• Depression present 73% of the time (WS)</li> </ul>

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## PROXIMAL CONTACT LOCATION, FORM, AND SIZE\*,\*\*

Arch/Tooth	MESIAL CONTACT			DISTAL CONTACT		
	IC/OC location	FL location	Form/size	IC/OC location	FL location	Form/Size
Maxillary Central Incisor	<ul style="list-style-type: none"> <li>• In incisal 1/3, near mesioincisal angle (FDS)(WS)</li> <li>• In Incisal 1/3 (JAK)(R)</li> </ul>	<ul style="list-style-type: none"> <li>• Centered faciolingually (FDS) (R)</li> </ul>	<ul style="list-style-type: none"> <li>• Ovoid with a larger incisocervical dimension (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Near junction of incisal and middle thirds (JAK)(R)(WS)</li> <li>• Cervical to mesial contact (AW)(De)</li> </ul>	<ul style="list-style-type: none"> <li>• Centered faciolingually (R)</li> </ul>	<ul style="list-style-type: none"> <li>• Ovoid but more nearly round than mesial contact (FDS)</li> </ul>
Maxillary Lateral Incisor	<ul style="list-style-type: none"> <li>• At junction of incisal and middle thirds (AW)(R) (JAK)</li> </ul>	<ul style="list-style-type: none"> <li>• Centered faciolingually (R)</li> </ul>	<ul style="list-style-type: none"> <li>• Similar to the central incisor (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Center of the middle third (AW)(JAK)(R)</li> </ul>	<ul style="list-style-type: none"> <li>• Centered faciolingually (R)</li> </ul>	<ul style="list-style-type: none"> <li>• Shorter incisocervically than mesial contact (FDS)</li> </ul>
Maxillary Canine	<ul style="list-style-type: none"> <li>• At junction of incisal and middle thirds (AW)(FDS)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>• About midway between the facial and lingual surfaces (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Ovoid with a larger incisocervical dimension (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• In the middle 1/3 (FDS)(JAK)(R)</li> </ul>	<ul style="list-style-type: none"> <li>• Similar to mesial surface (FDS), about halfway between the facial and lingual surfaces</li> </ul>	<ul style="list-style-type: none"> <li>• More circular than mesial contact, occupying about same area (FDS)</li> </ul>
Maxillary First Premolar	<ul style="list-style-type: none"> <li>• Near junction of occlusal and middle thirds (FDS)(R)</li> </ul>	<ul style="list-style-type: none"> <li>• Offset to the facial of center (FDS), near or at junction of facial and middle thirds (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Roughly circular in form (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Slightly cervical to the mesial contact (FDS) (WS) and in the middle third (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• In the middle third (WS), facial to the mesial contact (AW) (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Ovoid with a larger faciolingual dimension, larger area than the mesial contact (FDS)</li> </ul>
Maxillary Second Premolar	<ul style="list-style-type: none"> <li>• In the middle third, near junction of occlusal and middle thirds (R)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Similar to first premolar (FDS)</li> <li>• Near or at junction of facial and middle thirds (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Ovoid with a larger faciolingual dimension (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• In the middle third (R)(WS), slightly cervical to the mesial contact (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Similar to first premolar (FDS)</li> <li>• In the middle third, lingual to the mesial contact (AW) (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Ovoid with a larger faciolingual dimension (FDS)</li> </ul>
Maxillary First Molar	<ul style="list-style-type: none"> <li>• At junction of occlusal and middle thirds (FDS)(WS)(Di)(AW) (R)</li> </ul>	<ul style="list-style-type: none"> <li>• Slightly to the facial (FDS)(JAK)(R)</li> <li>• Somewhat facial to the center (AW)</li> <li>• Near the faciolingual center but facial to the distal contact (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Round to somewhat ovoid (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>• Half the distance from the cusp tip to the cervical line (AW)</li> <li>• At the occlusocervical midpoint (JAK)</li> <li>• In the middle third, near the occlusocervical center (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• About halfway between the facial and lingual surfaces (FDS)</li> <li>• In the center of the middle third (R)</li> <li>• Near the faciolingual center (WS)</li> </ul>	<ul style="list-style-type: none"> <li>• Irregularly long faciolingually, larger area than the mesial contact (FDS)</li> </ul>

(Continued)

## PROXIMAL CONTACT LOCATION, FORM, AND SIZE\*,\*\* (Continued)

Arch/Tooth	MESIAL CONTACT			DISTAL CONTACT		
	IC/OC location	FL location	Form/size	IC/OC location	FL location	Form/Size
Maxillary Second Molar	<ul style="list-style-type: none"> <li>At junction of occlusal and middle thirds (R)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>Resembles the first molar (FDS), slightly to the facial (R)</li> <li>Near the faciolingual center but facial to the distal contact (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Somewhat ovoid with a larger faciolingual dimension (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>In the middle third, near the occlusocervical center (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Resembles the first molar (FDS), about halfway between the facial and lingual surfaces</li> <li>Near the faciolingual center (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Similar to the first molar (FDS)</li> </ul>
Maxillary Third Molar	<ul style="list-style-type: none"> <li>In the middle third (R)</li> <li>At junction of occlusal and middle thirds (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Near the faciolingual center (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Not described</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>
Mandibular Central Incisor	<ul style="list-style-type: none"> <li>In the incisal 1/3 (AW)(FDS)(R)</li> <li>In the incisal 1/3, almost level with the incisal edge (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Centered faciolingually (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Ovoid with a larger incisocervical dimension (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>In the incisal 1/3 (AW) (FDS)(JAK)(R)</li> <li>In the incisal 1/3, almost level with the incisal edge (WS)</li> <li>Same as mesial surface (De)</li> </ul>	<ul style="list-style-type: none"> <li>Similar to the mesial contact (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Similar to the mesial contact (FDS)</li> </ul>
Mandibular Lateral Incisor	<ul style="list-style-type: none"> <li>Similar to central incisor (AW)(De)</li> <li>In the incisal 1/3 (FDS)(JAK)(R)</li> <li>In the incisal 1/3, fairly near the incisal edge (FDS)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>Similar to the central incisor, centered faciolingually (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Similar to the central incisor (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Cervical to mesial contact (AW)</li> <li>In the incisal 1/3, cervical to the mesial contact (FDS)(R)</li> <li>Noticeably cervical to the mesial contact (WS) but still in the incisal 1/3</li> </ul>	<ul style="list-style-type: none"> <li>Similar to the central incisor, centered faciolingually (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Similar to the central incisor (FDS)</li> </ul>
Mandibular Canine	<ul style="list-style-type: none"> <li>Near the mesioincisal angle (AW)(JAK)(R)</li> <li>In the incisal 1/3 (FDS)</li> <li>In the incisal 1/3, just cervical to the mesioincisal angle (WS)</li> </ul>	<ul style="list-style-type: none"> <li>About midway between the facial and lingual surfaces (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Ovoid with a larger incisocervical dimension (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>At junction of incisal and middle thirds (FDS)(JAK)(WS)</li> <li>Cervical to the mesial contact but incisal to the mesial contact of the maxillary canine (AW)</li> </ul>	<ul style="list-style-type: none"> <li>Similar to the mesial surface (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Outline form approaches a circular shape (FDS)</li> </ul>

Arch/Tooth	MESIAL CONTACT			DISTAL CONTACT		
	IC/OC location	FL location	Form/size	IC/OC location	FL location	Form/Size
Mandibular First Premolar	<ul style="list-style-type: none"> <li>Near junction of occlusal and middle thirds (DI)(R)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>Aligned with facial cusp (AW)(JAK)</li> <li>In the middle 1/3, toward the facial (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Circular to somewhat ovoid (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>In the region of the occlusal and middle thirds (DI)(R)</li> <li>Slightly occlusal to mesial contact (EXCEPTION to the guideline that distal contact is cervical to the mesial contact)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>Midway between the facial and lingual surfaces (AW)</li> </ul>	<ul style="list-style-type: none"> <li>Broader than the mesial contact (AW)(JAK)(R)</li> <li>Similar to the mesial surface but occupies a slightly broader area (FDS)</li> </ul>
Mandibular Second Premolar	<ul style="list-style-type: none"> <li>At junction of occlusal and middle thirds (FDS)(R)</li> <li>Slightly occlusal to first premolar (AW)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>Toward the facial (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Roughly circular, larger than mesial contact of first premolar (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Similar location to mesial contact (FDS) (R)</li> <li>Slightly cervical to the mesial contact (WS)</li> <li>Slightly occlusal to the first premolar (AW)</li> </ul>	<ul style="list-style-type: none"> <li>Similar to the mesial surface, toward the facial (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Ovoid with a larger faciolingual dimension, larger than the mesial contact (FDS)</li> </ul>
Mandibular First Molar	<ul style="list-style-type: none"> <li>At junction of occlusal and middle thirds (FDS)(R)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>Slightly to the facial (FDS)(R)</li> <li>Almost centered faciolingually (AW)</li> <li>About at the center (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Round to slightly ovoid (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>At junction of occlusal and middle thirds (FDS) (R), slightly cervical to the mesial contact (R)</li> </ul>	<ul style="list-style-type: none"> <li>Similar to the mesial contact (FDS)(R)</li> </ul>	<ul style="list-style-type: none"> <li>Ovoid with a larger faciolingual dimension, larger than the mesial contact (FDS)</li> </ul>
Mandibular Second Molar	<ul style="list-style-type: none"> <li>At junction of occlusal and middle thirds (R)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>Slightly facial to mesial contact of first molar (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Definitely ovoid with the lingual aspect of the contact located farther cervically than the mesial aspect (FDS)</li> </ul>	<ul style="list-style-type: none"> <li>Centered occlusocervically (FDS)</li> <li>In the middle third, near the occlusocervical center (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Centered faciolingually (AW)(FDS)(WS)</li> </ul>	<ul style="list-style-type: none"> <li>More irregular in form than the mesial contact, larger faciolingually (FDS)</li> </ul>
Mandibular Third Molar	<ul style="list-style-type: none"> <li>At junction of occlusal and middle thirds (WS)</li> </ul>	<ul style="list-style-type: none"> <li>Not described</li> </ul>	<ul style="list-style-type: none"> <li>Not described</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable</li> </ul>

\* Descriptions are presented in alphabetical order according to the name of the author/authors. When multiple authors identify the same location that description is presented first.

\*\* The following authors provide written descriptions or diagrams related to proximal contacts for some or all of the teeth: Ash/Wheeler (AW); Dewey (De); Diamond (DI); Fuller/Denehy/Schulein (FDS); Jordan/Abrams/Kraus (JAK); Renner (R); Woelfel/Scheid (WS).

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# ***ATLAS OF THE HUMAN DENTITION***

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## **REFERENCES**

This Atlas includes drawings of each primary and secondary tooth from five views (facial, lingual, mesial, distal, and incisal or occlusal) and composite drawings of multiple teeth that permit visual morphologic comparisons to be made. The teeth were drawn so they reflect the characteristics described by the authors of the following reference sources:

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11. Woelfel JB, Scheid RC. Dental Anatomy. 6<sup>th</sup> edition. Philadelphia: Lippincott Williams & Wilkins; 2002.

The primary and secondary tooth drawings were developed using dimensions that were calculated by averaging the dimensions provided in the following references:

1. Black GV. Dental Anatomy. 5<sup>th</sup> edition. Philadelphia: SS White Mfg. Co.; 1902.
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